Volume 37 • FEBRUARY, 1956 • No. 2

Archives of PHYSICAL MEDICINE *and* REHABILITATION

ORIGINAL ARTICLES

Comparative Heating Effects of Moistaire and Hydrocollator Hot Packs. William J. Erdman, II, M.D., and Emery K. Stoner, M.D. 71

Evaluation of Extension of the Hip. Martin O. Mundale, B.S.; Helen J. Hislop, M.S.; Raymond J. Rabideau, B.S., and Frederic J. Kottke, M.D. 75

Relationship of the Tilt of the Pelvis to Stable Posture. Frederic J. Kottke, M.D., and William G. Kubicek, Ph.D. 81

Effects of Ultrasound of High Intensity on Cellular Structures. Justus F. Lehmann, M.D.; Edward J. Baldes, Ph.D., and Frank H. Krusen, M.D. 90

An Assignment. W. W. Young, M.D., and Edwin B. Augustin, M.A. 96

Correspondence 100

Medical News 102

Physical Medicine Abstracts 106

Book Reviews 114

Editor of the Month
PAUL A. NELSON, M.D.
Cleveland

ANNUAL SESSION · ATLANTIC CITY, N. J. · SEPT. 9-14, 1956

Members
Standing Committees of the
American Congress of Physical Medicine and Rehabilitation
1956

Advances in Education
Donald L. Rose, Chairman
Robert C. Darling
Harold Dinken
Thomas F. Hines
Paul A. Nelson
James W. Rae, Jr.

Awards for Scientific Exhibits
Clarence Dail, Chairman
Thomas P. Anderson
Otto Eisert
William H. Georgi
Harry W. Mims

Balneology and Health Resorts
Hans J. Behrend, Chairman
William Bierman
Ferdinand Lustig
Walter S. McClellan
Ferdinand F. Schwartz
Samuel A. Warshaw

Braces, Splints and Prostheses
Morton Hoberman, Chairman
Robert L. Bennett
Louis P. Britt
Edward E. Gordon
David Rubin
Odon F. von Werssowetz

Central Office Pension and Insurance Plans
Ralph E. DeForest, Chairman
Frank H. Krusen
Walter J. Zeiter

Chronically Ill and Aged
Murray B. Ferderber, Chairman
Michael M. Dacso
Gustave Gingras
Edith L. Kristeller
Edward W. Lowman
Joseph N. Schaeffer

Constitution and By-Laws
Miland E. Knapp, Chairman
Earl C. Elkins
Joseph L. Koczur
Sedgwick Mead
F. Manley Brist, Ex-Officio

Cooperation with Air Force, Army, Navy, Public Health and Veterans Administration
Anton A. Tratar, Chairman
Anthony L. Brittis
A.B.C. Knudson
Harold B. Luscombe
Ray Piaskoski

Cooperation with Food and Drug Administration
Ralph E. DeForest, Chairman
Leonard F. Bender
Emil J. C. Hildenbrand
Harry Kessler
Isadore Levin
Edward B. Shires

Correlation of Physical Medicine and Psychiatry
Jack Meislin, Chairman
Daniel Dancik
Everill W. Fowlks
Keith C. Keeler
Norman Mitchell

John S. Coulter Memorial Lecture Fund
Ben L. Boynton, Chairman
H. Worley Kendell
Walter J. Zeiter

Ethics
Edward M. Krusen, Jr., Chairman
Josephine J. Buchanan
William J. LaJoie
Paul A. Nelson
George C. Twombly, Jr.

Finance
Louis B. Newman
Herbert W. Park
Charles S. Wise
Frank H. Krusen, Ex-Officio

Foster, Encourage and Coordinate Research Projects
Jerome W. Gersten, Chairman
Robert W. Boyle
Robert C. Darling
O. Leonard Huddleston
Y. T. Oester

Gold Key Award
Donald L. Rose, Chairman
Donald A. Covalt
Donald J. Erickson
Arthur C. Jones
Frederic J. Kottke

Legislation
Glenn Gullickson, Jr., Chairman
Thomas P. Anderson
Frances Baker
Robert L. Bennett
A. Ray Dawson
Arthur C. Jones
George H. Koepke
Oscar O. Selke, Jr.
Samuel S. Sverdlik
Charles S. Wise
Dorothea C. Augustin, Ex-Officio
F. Manley Brist, Ex-Officio

Medical Auxiliary Services Related to Physical Medicine and Rehabilitation
A. Ray Dawson, Chairman
Herman J. Bearzy
Donald A. Covalt
Donald J. Erickson
Bruce B. Grynbaum
Roy H. Nyquist

Medical Economics
Herman L. Rudolph, Chairman
Ernest F. Adams
George D. Wilson

Meeting Place
Walter J. Zeiter, Chairman
Lewis A. Leavitt
Jacob L. Rudd
Leonard J. Yamshon

Membership
Florence I. Mahoney, Chairman
Harvey F. Davis
Otto Eisert
Shelby G. Gamble
Albin T. Jousse
David M. Paul
Raoul C. Psaki
Samuel Sherman
Vann S. Taylor

Nominating
George Morris Piersol, Chairman
Earl C. Elkins
H. Worley Kendell
Fred B. Moor
William H. Schmidt
Arthur L. Watkins

Prize Lecture
Frederic T. Jung, Chairman
Fritz Friedland
O. Leonard Huddleston
William D. Paul

Program
Frederic J. Kottke, Chairman
Louis B. Newman
Walter J. Zeiter

Public Relations
Frank H. Krusen, Chairman
Robert L. Bennett
Donald L. Rose

Regional Sections
George K. Stillwell, Chairman
Karl E. Carlson
Charles D. Shields

Rehabilitation Centers
Joseph N. Schaeffer, Chairman
Nila Kirkpatrick Covalt
Arthur A. Rodriquez
Allen S. Russek
Jerome S. Tobis
Ralph E. Worden

ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION

30 North Michigan Avenue, Chicago 2, Illinois

OFFICIAL JOURNAL
AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION
AMERICAN ACADEMY OF PHYSICAL MEDICINE AND REHABILITATION

Original contributions, exchanges and books for review should be forwarded to the Editorial Office. All business matters including advertising should be handled through the Executive Office, 30 N. Michigan Ave., Chicago 2, Illinois. The statements in the manuscripts published in the ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION are made solely on the responsibility of the author. The American Congress of Physical Medicine and Rehabilitation and/or the American Academy of Physical Medicine and Rehabilitation does not assume any responsibility for statements contained therein. Manuscripts accepted for publication in the ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION are for exclusive publication and may not be published elsewhere.

OFFICERS

American Congress of Physical Medicine and Rehabilitation

GORDON M. MARTIN, M.D.
Rochester, Minn., President
A.B.C. KNUDSON, M.D.
Washington, D.C., President-Elect
DONALD L. ROSE, M.D.
Kansas City, Kans., First Vice-President
ARTHUR C. JONES, M.D.
Portland, Ore., Second Vice-President
FREDERIC J. KOTTKE, M.D.
Minneapolis, Third Vice-President
DONALD A. COVALT, M.D.
New York, Fourth Vice-President
DONALD J. ERICKSON, M.D.
Rochester, Minn., Fifth Vice-President
FRANCES BAKER, M.D.
San Mateo, Calif., Secretary
FRANK H. KRUSEN, M.D.
Rochester, Minn., Treasurer
WALTER J. ZEITER, M.D.
Cleveland, Executive Director
DOROTHEA C. AUGUSTIN
Chicago, Executive Secretary

EXECUTIVE COUNCIL

William D. Paul, M.D., Iowa City, Chairman.
Norman E. Titus, M.D., Savannah, Ga., Secretary.
Robert L. Bennett, M.D., Warm Springs, Ga.
William Bierman, M.D., New York.
Earl C. Elkins, M.D., Rochester, Minn.
Kristian G. Hansson, M.D., New York.
John Severy Hibben, M.D., Pasadena.
Abraham R. Hollender, M.D., Miami Beach, Fla.
O. Leonard Huddleston, M.D., Santa Monica, Calif.
H. Worley Kendell, M.D., Peoria, Ill.
Miland E. Knapp, M.D., Minneapolis.
Disraeli Kobak, M.D., Chicago.
Frank H. Krusen, M.D., Rochester, Minn.
Walter S. McClellan, M.D., Chapel Hill, N. C.
Fred B. Moor, M.D., Los Angeles.
Nathan H. Polmer, M.D., New Orleans.
William H. Schmidt, M.D., Philadelphia.
Wm. Benham Snow, M.D., New York.
Arthur L. Watkins, M.D., Boston.
Gordon M. Martin, M.D., Rochester, Minn., Ex-Officio

EDITOR EMERITUS

Disraeli Kobak, M.D., Chicago.

Subscription—In the United States, its possessions, and Mexico, $7.00 yearly; Canada, $8.00; elsewhere, $14.00 the year; $0.75 per single copy. Advertising rates on application. All advertising copy subject to acceptance by Publication Committee.

COPYRIGHT: Matter appearing in the ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION is covered by copyright. Permission will be granted on request for reproduction in reputable publications if proper credit is given. Reproduction for commercial purposes will not be permitted.

Published monthly at Chicago, Illinois, by the American Congress of Physical Medicine and Rehabilitation. Entered as Second Class Matter at the Post Office at Chicago, Illinois.

Copyright 1956, by The American Congress of Physical Medicine and Rehabilitation.

EDITORIAL BOARD

EARL C. ELKINS, M.D., Rochester, Minn., Chairman
ARTHUR C. JONES, M.D., Portland, Ore.
FREDERIC J. KOTTKE, M.D., Minneapolis
FRED B. MOOR, M.D., Los Angeles
PAUL A. NELSON, M.D., Cleveland
GEORGE M. PIERSOL, M.D., Philadelphia
ARTHUR L. WATKINS, M.D., Boston

CONSULTANTS TO EDITORIAL BOARD

C. KNIGHT ALDRICH, M.D., Chicago
LENOX D. BAKER, M.D., Durham, N.C.
LEO BARTEMEIER, M.D., Baltimore
CYRIL COURVILLE, M.D., Los Angeles
ROBERT C. DARLING, M.D., New York City
OTTO GLASSER, Ph.D., Cleveland
JAMES G. GOLSETH, M.D., Pasadena, Calif.
W. HENRY HOLLINSHEAD, Ph.D., Rochester, Minn.
WILLIAM KUBICEK, Ph.D., Minneapolis
IRVINE McQUARRIE, M.D., Minneapolis

The ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION is devoted to the publication of significant articles in this particular field. Contributions of interest to those in physical medicine and rehabilitation are invited. Articles are accepted only with the understanding that they are contributed exclusively to the ARCHIVES. Articles and accompanying illustrations become the property of the journal.

MANUSCRIPTS

Submit only the original copy of the article, but retain a copy for use in correcting galley proofs. Carbon copies are not acceptable for editing and typesetting purposes.

REFERENCES

References should be placed at the end of the manuscript and should conform to the style of the Quarterly Cumulative Index Medicus. No more than twenty references should be included with a manuscript.

ILLUSTRATIONS

Only reproducible illustrations will be accepted. The Editorial Board reserves the right to limit the number and size of illustrations used with any manuscript submitted for publication. The author is responsible for any charges in the preparation of zincs and half-tones from illustrations.

REPRINTS

Reprint order blanks with a schedule of prices will be attached to galley proofs. Individual reprints of an article must be obtained direct from the author.

COPYRIGHT

Matter appearing in the ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION is covered by copyright. Permission for reproduction must be directed to the Editorial Board.

Detailed information covering instructions for the preparation of manuscripts for publication may be had by writing direct to the Editorial Office, 30 N. Michigan Ave., Chicago 2.

Printed in U.S.A.

Once again

DALLONS is "FIRST in ULTRASONICS"

*U.S. Patent No. 2,531,844

Dallons Sonar-Test

IMMEDIATE INDICATION OF ULTRASONIC OUTPUT IN WATTS . . . . . *for medical and technical uses*

The Dallons SONAR-TEST* is an extremely sensitive high-precision, direct-reading instrument to accurately measure ultrasonic output in watts. The full scale deflection of 52 watts is exact within ±5% in the entire frequency range of 175 to 3000 Kc.... It's primary use is to accurately establish dosage for ultrasonic therapy. It is not limited to Dallons Medi-Sonar equipment but indicates the exact output in watts of all other transducers or treatment heads. It may also be used to determine sound intensities in other than medical research and therapy.

DALLONS LABORATORIES
INC.
"first in Ultrasonics"

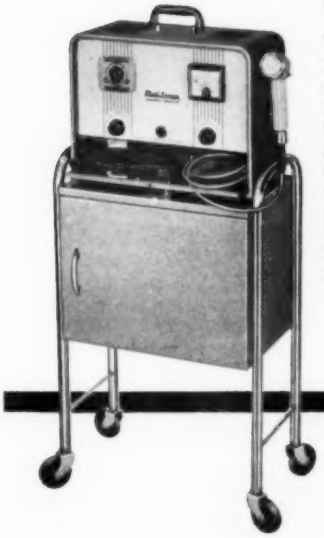
5066 Santa Monica Blvd.
Los Angeles 29, NO 4-1951

DL-46

For descriptive literature, case histories and other pertinent data, write direct to manufacturer for Packet No. B

MEDI-SONAR
Model 1050

A precise, heavy duty ultrasonic generator. Specially designed transducer, 12.5 sq.cm. quartz crystal, cylindrical output pattern. Maximum sound intensity is 34 watts. Precision calibrated. Uninterrupted energy measured on easy-to-read double-scale meter showing both total output and output per sq.cm. Fully rectified and filtered power supply. Licensed under U.S. patents. CSA, U/L and FCC type approved. Sub-cabinet included. Unconditional triple guarantee.



MEDI-SONAR
Model 1100

Fully portable, weight 30 lbs. Guaranteed minimum total output 20 watts. Same 0 — 15 minute timer, output meter, and controls as model 1000. Has 10 sq.cm. crystal. Built-in cable and transducer compartment. Protective fabricoid carrying case. Identical guarantee. All cabinets and bases beautifully finished in either green or ivory with chrome decor . . . Readily movable sturdy sub-cabinet is optional.

FILL OUT AND MAIL TODAY

DALLONS LABORATORIES, INC.
5066 Santa Monica Blvd., Los Angeles 29, California
Please send full information B

NAME_____

STREET_____

CITY_____ STATE_____

NOW . . .
MEDCO COMBINES BOTH SIMPLICITY AND UTILITY IN THE

Medcolator®

MODEL K

WITH

RECIPROCAL STIMULATION

$295.00

An adjunct therapy for sprains, strains, dislocations, other trauma of the muscle and skeletal system. The MEDCOLATOR Model K combines the Simplicity of Model 50 with the Utility of Model 50B.

WRITE
For Your FREE
Pad Placement
COLOR CHART
For Wall Hanging

MEDCO PRODUCTS CO.
3603 East Admiral Place • Tulsa, Oklahoma

Medco Products Co.
Mail Address: P. O. Box 3275-A
3603 E. Admiral Pl. • Tulsa, Oklahoma

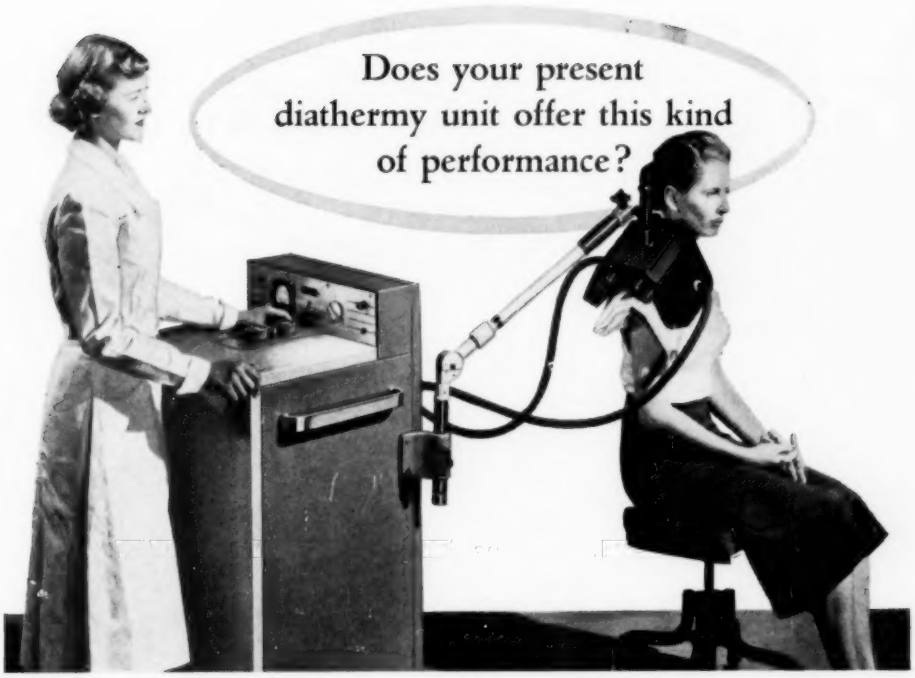
- ☐ Please send Pad Placement Color Chart.
- ☐ Please send MEDCOLATOR Model K with Reciprocal Stimulation for 30 day FREE trial.
- ☐ Please send descriptive literature on MEDCOLATOR Model K.

NAME_____

ADDRESS_____

CITY_____ STATE_____

Serving the Profession Since 1932



13.56 megacycles . . . proved best for induction heating

yours with the G-E F-II Inductotherm®

Results in diathermy are produced by vascular heat — *not* surface heat. That's why General Electric's Model F-II Inductotherm operates at 13.56 megacycles — the proven optimum range for most efficient heating of vascular tissue.

What's more this G-E unit has a rated output of 200 watts — more than enough for all modern technics. And you get built-in reserve for long-life performance.

The versatile General Electric Inductotherm unit lets you handle the complete range of treatments *easily, effectively and safely.*

Get all the facts from your G-E x-ray representative. Or write X-Ray Department, General Electric Company, Milwaukee 1, Wisconsin, for Pub. 0-25.

- Unit features full adjustable contour-following electrode. (Illustrated).
- Optional equipment includes 12-ft. cable electrode . . . fully adjustable, air-spaced condenser-type electrode . . . electrosurgical kit.
- Amplifier tube has high capacity for long, dependable service.
- Crystal oscillator circuit assures consistent operation at approved frequency.
- Controls are simple. Electrodes attach to rear of unit.
- Preset timer automatically ends treatment. For extra safety, convenient switch cord lets patient shut off unit at any time.

Progress Is Our Most Important Product

GENERAL ELECTRIC

IN ULTRASONIC THERAPY
The *Burdick* UT-1 Ultrasonic Unit
offers you these important features:

1. **Coupling Signal** — audible signal tells operator when contact is inadequate.
2. **Single Continuous Power Control** — no tuning required.
3. **Preset Switch** — intensity output can be preset by using push button switch and power control.
4. **Double Scale Meter** — registers intensity (watts per square centimeter) and total output.
5. **Automatic Timer Switch** — 0-15 minutes.

Write for comprehensive literature or see your Burdick dealer.

F.C.C. Approval No. U-101
Approved by Underwriters' Laboratories, Inc.

THE BURDICK CORPORATION
MILTON, WISCONSIN

Comparative Heating Effects of Moistaire and Hydrocollator Hot Packs

William J. Erdman, II, M.D.
and
Emery K. Stoner, M.D.
Philadelphia

New methods and devices for the application of heat are being developed continuously. As they appear, they should be tested and evaluated for advantages they may have over present methods. Therefore, we undertook an objective study of the heating properties of the apparatus mentioned in order to acquire a better basis for their clinical application.

Description of Apparatus

This work was performed utilizing the Hydrocollator Packs* and the Moistaire** apparatus. The results were compared to our previous work in which conventional hot packs and infrared heating were used.

A Hydrocollator steam pack consists of a cotton bag that is soaked in hot water for application to a patient as a hot pack. The bag measures 10x12 inches and is divided into rectangular sections, which facilitate folding and rolling the pack for application to extremities. Each pack is filled with one ounce of silicate gel, a native, colloidal, hydrated, aluminum silicate. During heating, silicate gel takes up water to form a soft bulky mass that retains heat.

The Moistaire apparatus consists of a treatment table, treatment hood, recirculation unit, and accessories, such as a table pad, waterproof curtains, and a water container. Air is circulated and humidified under thermostatic control for therapeutic applications to large areas of the body. Preheated air enters a mixing chamber into which a small centrifugal pump lifts preheated water. Saturated air is forced by the pump from the mixing chamber to the treatment hood where warm water vapor condenses on the part of the body being treated. The air then returns to the mixing chamber for reheating and rehumidifying and circulates to maintain uniform temperatures and humidity.

*Courtesy Chattanooga Pharmacal Corporation.
**Courtesy Ries Corporation.

Method

The procedures were carried out in a constant temperature room, with the room air temperature between 20 and 24 C. The subjects, normal, healthy adults, were lightly clad and were in the fasting state. One long needle copper-constantan thermocouple was inserted in the lateral thigh muscles, so as to have the thermocouple adjacent to the femur. Another needle thermocouple was placed subcutaneously, above and less deep than the first one. Other thermocouples were placed over the skin of the thigh, both great toes, left middle finger, and in the rectum. The temperature of each area and of the room was recorded automatically every 2 minutes by a Brown potentiometer. After a control period, heat was applied for 20 to 60 minutes, followed by a cooling period. With the Moistaire unit, both legs up to the top of the pelvis were heated, but the feet were allowed to remain exposed to the room air. With the Hydrocollator packs, one thigh was heated, using two packs, and the spacing with towels was regulated by the subject's sensation. Eight experiments with each method were performed.

Read at the Thirty-third Annual Session of the American Congress of Physical Medicine and Rehabilitation, Detroit, September 1, 1955.

Director (Dr. Erdman) and Clinical Director (Dr. Stoner), Department of Physical Medicine and Rehabilitation, Hospital of University of Pennsylvania.

Results

Moistaire: The water in the reservoir was kept at about 118 F. Seven of the eight subjects felt that the heat was comfortable and they remained at ease throughout the heating period. The remaining subject became uncomfortable after complete vasodilatation had occurred and rectal temperature began increasing.

The maximum temperature of the thigh was 41.1 C. The heat was even, with no tendency for spot heating. The entire treated area was pink and wet because of condensation of moisture and sweating.

The deep muscle temperature changed little until a general increase in body temperature occurred. Subcutaneous temperature in the heated area gradually increased to rectal temperature and usually exceeded it slightly. Peripheral vasodilatation was more or less complete in the fingers and toes, depending on the room temperature, the quantity of heat absorbed, and the vascular status of the subject.

Figure 1 illustrates the temperature effects of heating both legs and thighs in the Moistaire apparatus for 30 minutes. In this instance, rectal temperature was increased by 0.4 C. and the deep muscle and subcutaneous temperatures reached that of the rectal temperature. The surface of the thigh reached 41 C. Complete vasodilatation of the fingers and toes was seen after 18 minutes of heating.

Hydrocollator Packs: The time of packing was varied from 20 to 60 minutes. In preparation for use, the packs were kept in a special unit, where the hot water was thermostatically varied from 130 to 180 F. From 175 to 180 F. appeared to be optimum from the point of comfort of the patient, as long as adequate toweling was used for insulation. This is the usual temperature in the commercially available unit. A well-insulated

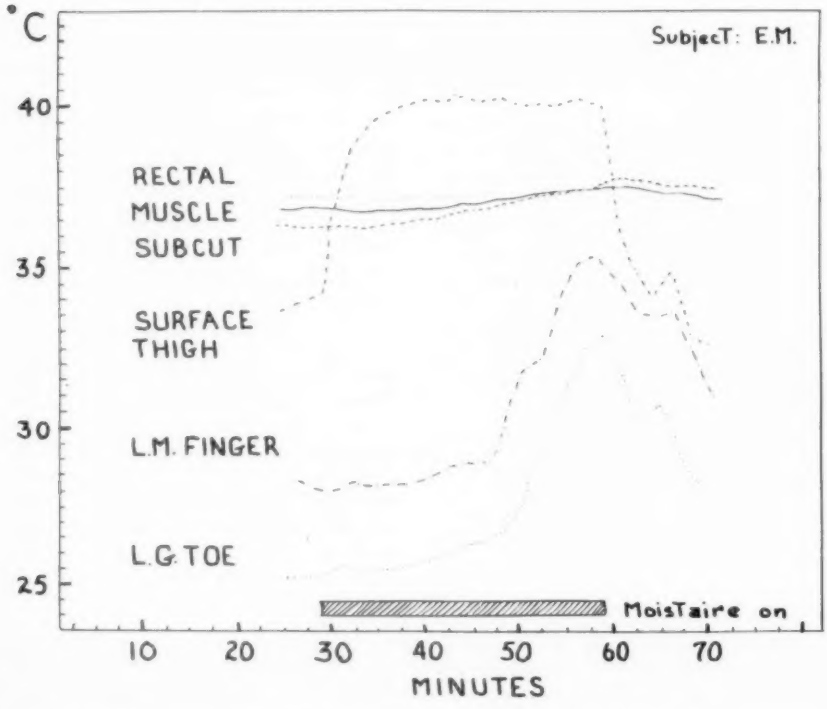


Fig. 1 — Temperature curves produced by the heating of the lower extremities in the Moistaire apparatus.

pack at higher temperatures held its heat longer at subjectively comfortable temperatures. One packing was effective for at least 30 minutes. Rectal or deep muscle temperature did not change. Subcutaneous temperature increased to approximately rectal temperature. Finger and toe temperatures were altered only slightly. In one case, with the room temperature between 24 to 25 C., complete vasodilatation occurred initially. In all other cases, the temperature remained unchanged, with two showing slight increases (31 C.) in finger temperature.

Figure 2 illustrates the effect of hydrocollator packing of the right thigh. Changes in rectal, deep muscle, or subcutaneous temperature were not significant. For purposes of clarity, the readings from only one great toe are shown as they paralleled each other.

Discussion

The Moistaire apparatus and the Hydrocollator Packs are two more devices for applying superficial heating (as contrasted to diathermy, microwave, and ultrasound). There is no effective penetration of the heat. The main effect on temperature is to decrease the gradient between skin, subcutaneous, and deep muscle temperatures (see table). This was also seen in the effects of conventional hot packs[1] where the quantity of heat energy involved was small; however, surface heating has been found effective clinically. How it relieves pain is still not clear. Wells[2] feels that it is this decrease in temperature gradient of the skin and deeper tissues that relieves discomfort. If this is so, then merely insulating a part to prevent heat loss should have similar temperature effects (for ex-

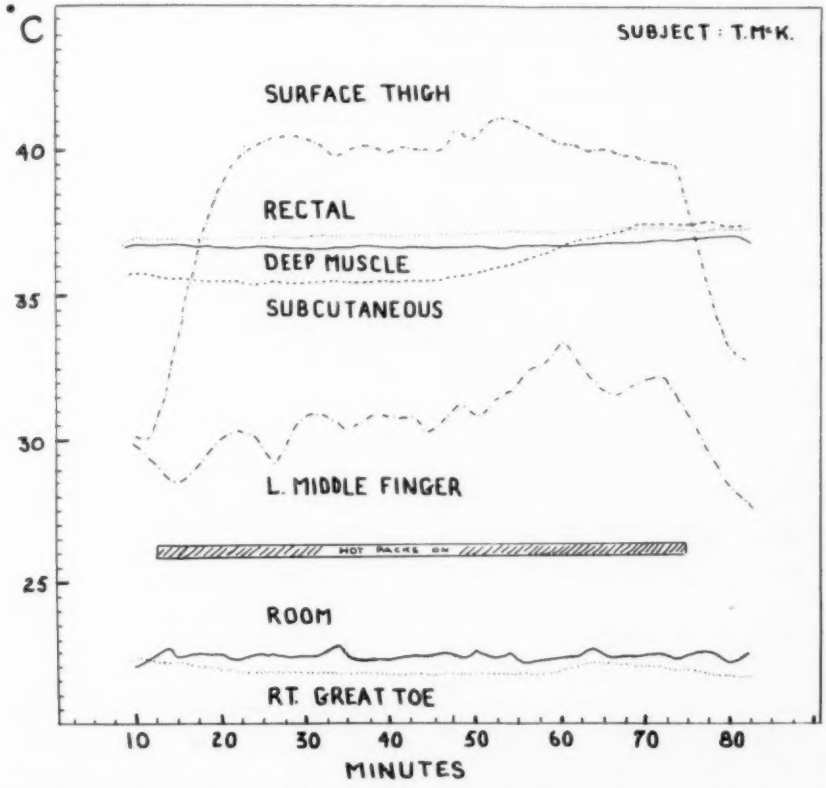


Fig. 2 — Temperature curves produced by the use of two hydrocollator packs on the right thigh for a period of 48 minutes.

Temperature Changes in Experiments with Moistaire and Hydrocollator Packs*

Expt. No.	Heating Period, Min.	Temp. of Applied Heat, F.	Rectal Temp., C.	Deep Muscle Temp., C.	Subcut. Temp., C.	Thigh Surface Temp., C.	Vasodilatation		Room Temp., C.
							Fingers	Toes	
MOISTAIRE									
WE-1	30	118	37.0-37.1	36.5	33.4-36.7	33.1-39.8	in 18'	in 26'	24-25
EM-2	30	119	37.1-37.5	36.7-37.5	36.3-37.5	34.1-41.0	in 18'	in 18'	23-24
TM-3	38	118	37.4-37.3	36.9	35.2-37.4	31.8-41.0	immediate	partial	22-23
KT-4	36	122	37.3-37.6	37.3-37.4	37.1-37.2	32.8-41.1	immediate	in 16'	21-22
ES-5	40	118	37.2-37.3	36.6-36.9	34.9-38.6	32.1-40.7	partial	none	20-21
RA-6	38	120	37.3	37.0-36.8	35.0-38.4	31.6-40.8	in 16'	none	22
PG-7	30	118	37.1	37.0-37.1	35.8-37.4	33.9-39.6	in 18'	none	19-20
MS-8	40	117	37.4	35.6-37.0	34.5-37.9	32.2-39.2	initially	none	21-22
HYDROCOLLATOR PACKS									
WE-1	20	143	37.1	36.6	35.3-36.2	33.9-40.1	initially	initially	24-25
EM-2	20	160	37.4-37.3	37.1	36.7	34.1-41.0	partial	none	23-24
TM-3	62	170	37.1	36.7	35.8-37.1	30.2-41.0	none	none	22-23
KT-4	48	136	37.1-37.2	37.0	37.0	33.0-41.3	in 14'	none	21-22
ES-5	40	180	37.1-37.2	37.0	33.7-38.4	31.5-42.2	none	none	20-27
RA-6	33	180	37.2	37.2-37.0	34.3-37.3	31.5-41.1	none	none	22
PG-7	20	180	37.0-37.1	37.0-37.1	36.3-37.8	34.9-40.3	partial	none	19-20
MS-8	24	180	37.2	36.9-37.2	35.0-38.3	31.0-40.4	none	none	21-22

*The first temperatures are control; the second are the maximum temperatures during the heating period.

ample, by using knee warmers, wool socks, or heavy underclothing). This has been found effective in peripheral vascular diseases and to some extent in the arthritides.

Infrared heating[3] causes skin to become hot quickly. The subcutaneous temperature approaches rectal temperature, while the deep muscle and rectal temperature are unchanged unless general body heating occurs.

Conclusions

Heat applied locally has similar reflex effects. The methods of application vary only as to the quantity of heat delivered or developed, in the depth of heat penetration, and as with the use of ultrasound, specific heating at interfaces. Various pieces of equipment differ considerably in ease of application, areas covered, and subjective sensation.

Moistaire heating is soothing and conducive to relaxation and sleep. A large quantity of heat can be absorbed by the tissues and general body heating can result. The heat does not penetrate appreciably, and deeper tissues become warmer only if body temperatures increase. The apparatus is especially suitable for heating large surface areas.

Hydrocollator packs too are comfortable and effective. Heat penetration to deep muscle is not appreciable and body temperature is unchanged. These packs are simple to use, inexpensive, and can be prescribed for patients to use at home.

This study and those made previously indicate that infrared, hot packs, hydrocollator packs, and moistaire have the same local heating effects and similar peripheral reflex effects. Thus, choice among them would depend on the area to be treated, the availability of the equipment, and the preference of the physician or patient.

References

1. Sweeney, F. X., and Stoner, E. K.: Hot Packing. Arch. Phys. Med. 32:206 (April) 1951.
2. Wells, H. S.: Temperature Equalization for the Relief of Pain; An Experimental Study of the Relation of Thermal Gradients to Pain. Arch. Phys. Med. 28:135 (Mar.) 1947.
3. Sweeney, F. X.; Horvath, S. M.; Mellette, H. C., and Hutt, B. K.: Infrared Heating of Tissues. Arch. Phys. Med. 31:493 (Aug.) 1950.

Evaluation of Extension of the Hip

Martin O. Mundale, B.S., A.R.P.T.
Helen J. Hislop, M.S., A.R.P.T.
Raymond J. Rabideau, B.S., A.R.P.T.
and
Frederic J. Kottke, M.D.
Minneapolis

The key to posture is the position and control of the pelvis. Interest in the measurement of the pelvi-femoral angle arose when it was found that patients with abnormal tilting of the pelvis and extreme lordosis often appeared to approach normal limits of hip extension when measured by the more common methods.[1-5]

Careful consideration of these technics revealed that the position of the innominate bone was not defined prior to measuring the angle at the hip joint. The two lines of reference most commonly used in measuring range of motion of the hip are the midlines of the femur and torso. It is obvious that the lateral midline of the torso is a flexible line that may bend backwards or forwards and certainly cannot be defined under all conditions by a single straight line. To complicate this problem, any angulation in the hip is usually accompanied by a compensatory movement of the lumbar spine — the greater the hip flexion contracture, the greater will be the hyperextension of the lumbar spine. In order to measure accurately the motion occurring in the hip joint, not only must the position of the femur be defined but also the position of the innominate bone.

It is the purpose of this paper to present a simple method of measurement of motion occurring in the hip and an evaluation of the accuracy and the reproducibility of the method.

The data accumulated in the study was from 36 normal college men and women between the ages of 20 and 30 years. Of these, 16 were men and 20 were women. There were no apparent physical defects.

Establishing Position of Innominate Bone

To establish the position of the innominate bone, fixed subcutaneous landmarks were used. The anterior and posterior superior iliac spines were the selected points on the innominate. The summit of the greater trochanter, which is situated approximately at the level of the center of the acetabulum, was selected to represent the axis of motion. The lateral epicondyle of the femur was chosen as the landmark at the distal end of the femur.[6-7]

After selecting and marking the landmarks, the axes of the innominate bone were established (fig. 1). The transverse axis of the innominate bone is represented by a line drawn from the anterior to the posterior superior iliac spine. The longitudinal axis of the innominate bone is represented by a line dropped perpendicularly from the transverse axis through the summit of the greater trochanter. The lever arm of the femur is defined by projecting a line from the summit of the greater trochanter to the lateral epicondyle of the femur. It is important to rotate the femur passively to locate accurately the summit of the greater trochanter before positioning the extremity in the anatomical position.

Basic Positions

Four basic positions were used in the study: prone, passive extension when prone, relaxed standing, and standing with the trunk in extension.

Read at the Thirty-third Annual Session of the American Congress of Physical Medicine and Rehabilitation, Detroit, September 1, 1955.

From the Department of Physical Medicine and Rehabilitation, University of Minnesota Medical School.

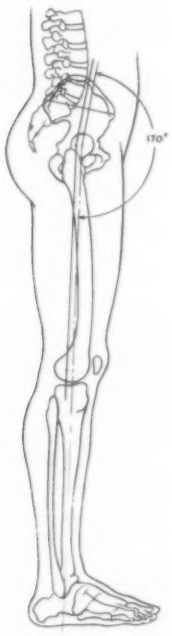


Fig. 1 — The landmarks and lines of reference used in determining the pelvi-femoral angle. The horizontal axis of the innominate is a line drawn from the anterior to the posterior superior iliac spine. The vertical axis of the innominate is the perpendicular line dropped to the center of motion of the hip joint. The broken lines indicate the lines of reference for x-ray measurement, the solid lines, the external measurements. The angle of measurement is the average for normal young men during relaxed standing.

Prone: Subjects were placed on a firm table and positioned in good alignment. Narrow masking tape was then stretched along the lines of reference previously described (fig. 2). Flesh pencil or an ordinary pen would suffice in projecting the lines of reference in clinical measurement. To avoid tell-tale landmarks they were not used in the study. A goniometer was used to measure the angle formed by the lines representing the longitudinal axis of the pelvis and the lateral midline of the femur.

Passive Extension when Prone: Subjects were placed on the table in good bodily alignment. The passive motion was carried out by an assistant who cradled the thigh and carried it through its maximum range of extension (fig. 3). The pelvis was stabilized to rule out rotation of the pelvis. The longitudinal axes of the pelvis and femur were then projected and measured with a goniometer.

Standing: Subjects were instructed to assume their normal standing posture. An attempt to rule out "alert standing" was made by having them maintain the standing position for two minutes or until any noticeable "muscle setting" of the hip extensors had diminished. The lines of reference were projected and the angle determined by use of the goniometer (fig. 4).

Standing with Trunk Extension: A rope was suspended from the ceiling; the subjects were instructed to advance the left leg and then, grasping the rope for support, to lean slowly backwards (fig. 5). Support was given manually during the palpation for landmarks and projection of the lines of reference. Measurement of the angle formed was the same as for the other positions.

In recording the angle of measurement, the full circle method was used, that is, flexion is the motion approaching zero, and extension is the motion approaching 360 degrees. Thus the angle of flexion is acute and the angle of extension obtuse.[1] In the method advocated in this paper, it was found that only one individual exceeded a measurement of 180 degrees regardless of the force exerted in the direction of extension. This one exception was a trained athlete who had participated in vigorous stretching exercises from about the age of nine until the time of measurement. The apparent overextension of the femur that is observed when a limb is pushed as far back as possible is actually slight flexion of the other hip and overextension of the lumbar spine. The iliofemoral, pubofemoral and ischiofemoral ligaments

Fig. 2 — Relationship of pelvis to femur in prone position, demonstrating technic of measurement. Hip extension 160 degrees.

Fig. 3 — Measurement of passive extension when prone. The lines of reference illustrate that the apparent "hyperextension" is actually extension of the lumbar spine. Hip extension 174 degrees.

plus the iliopsoas muscle serve to check hyperextension of the femur. The degree of extension is diminished further if the tone of the flexors of the hip is increased or if definite contractures have developed. It is this problem which gives significance to accurate measurement of the pelvi-femoral angle. The bulkiness of soft tissue in this area and the compensatory motion of the lumbar spine and opposite hip often obscure the limitation of motion that actually exists. The use of masking tape or flesh pencil in projecting the lines of reference, when combined with a posture screen, serves as an excellent visual aid in demonstrating the effects of abnormal tilting of the pelvis on the overall alignment of the other segments of the body.

To determine the spread and the mean of the measurements in the various positions, 216 measurements by two therapists were used (fig. 6). The mean range of extension for young men and women in the various positions is as follows:

External Measurement Compared with X-ray

To determine the reproducibility of the method, pilot studies consisted of the comparison of external measurements with x-ray measurements. Small lead pieces were placed over the landmarks selected by the therapist. It was found that the surface landmarks as selected by the therapist were reasonably accurate. The method of measuring x-ray findings varied from the external measurement technic in that the longitudinal axis of the femur was determined by projecting a line from the center of the acetabulum to the center of the weight-bearing surface of the femur. Comparison of the lines in the two methods revealed that they were approximately parallel (fig. 1). It was also determined that the external measurements compared favorably with those of x-ray. Comparison of the two methods showed that external measurement did not vary from the x-ray measurements by more than ± 5 degrees. There appears to be a systematic error in that the therapists' measurement is generally a few degrees greater than that by x-ray (fig. 7).

	Prone	Passive Extension Prone	Relaxed Standing	Trunk Extension Standing
Men	159.5°	169.9°	169.5°	174.9°
Women	155.3°	167.7°	164.7°	172.4°

Fig. 4 — The pelvi-femoral angle in relaxed standing. Hip extension 169 degrees.

Fig. 5 — Maximal hip extension when standing with the trunk extended. This position was found to produce the greatest measurable hip extension, 178 degrees.

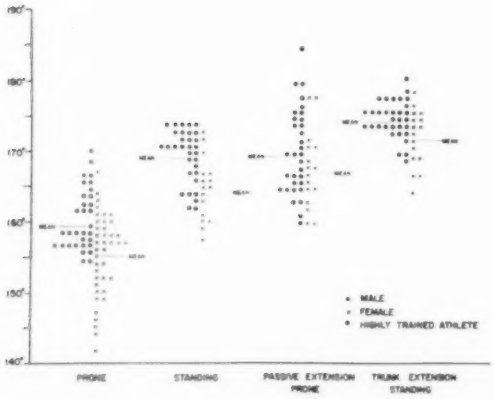


Fig. 6 — Range of hip extension of normal men and women, 20 to 30 years of age, in four basic positions.

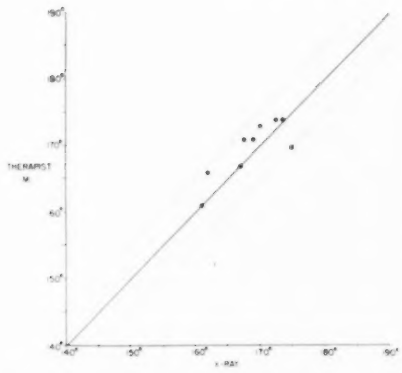


Fig. 7 — Comparison of hip extension measured with a goniometer with the angle of hip extension determined by x-ray. Broken lines are placed 5 degrees equidistant from the line of equality of measurement.

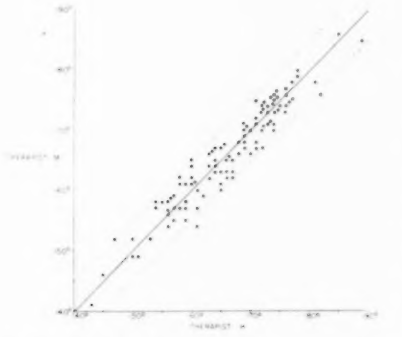


Fig. 8 — Reproducibility of the measurement of hip extension by two physical therapists. The broken lines represent a space of 5 degrees equidistant from the line of equality of measurement.

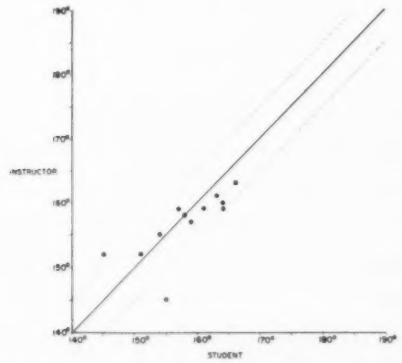


Fig. 9 — Comparison of the measurement of hip extension of 12 subjects by 12 students after one training session with the measurement by an instructor. All measurements were made with subject in the prone position.

Comparison of Measurements of Two Therapists

The next approach used in determining the reproducibility of the measurement of hip extension involved the comparison of external measurements taken by two therapists trained in the method. Separate rooms were used to avoid the influence of one therapist's technic on the other. Measurements on each subject were taken within approximately one hour. Statistical evaluation of 108 pairs of measurements on 36 patients based on four positions show a mean difference of 0.6 degrees between the two observers. The standard deviation of the series is ±2 degrees. Ninety-five percent of the measurements check within ±4 degrees and 99 percent within ±6 degrees (fig. 8).

Measurements by Inexperienced Students

To determine the reproducibility of the method by individuals not previously trained in the technic, twelve physical therapy students were given a brief orientation on the technic employed. Each student was given a subject to measure in the prone position. A comparison was then made of the student's first attempt at measuring with the measurement by one of the therapists participating in the study (fig. 9); the measurements compared favorably.

Summary

Common methods of measuring extension of the hip do not define the position of the innominate bone prior to measuring the angle of the hip joint. The apparent "overextension" of the hip joint is actually extension of the lumbar spine and flexion of the opposite hip. A simple method of measuring the pelvifemoral angle has been used in this study. By using fixed anatomical landmarks, the relationship of the two bones in the lever system, the innominate bone and the femur, can be measured with a fair degree of accuracy. In 95 percent of the measurements a single therapist will reproduce the measurement within ±4 degrees. The method can be readily taught with a minimum amount of training.

References

1. Knapp, M. E., and West, C. C.: Measurement of Joint Motion. Bull. U. Minn. Hospitals Staff Meet. 15:405 (May) 1944.
2. McBride, E. D.: Disability Evaluation, Philadelphia, J. B. Lippincott Company, 1953.
3. Moore, M. L.: The Measurement of Joint Motion; Part I: Introductory Review of the Literature. Phys. Therapy Rev. 29:195 (May) 1949; Part II: The Technic of Goniometry. Phys. Therapy Rev. 29:256 (June) 1949.
4. Wiechec, F. J., and Krusen, F. H.: A New Method of Joint Measurement and a Review of the Literature. Am. J. Surg. 43:659 (Mar.) 1939.
5. Rice, C. O.: Calculation of Industrial Disabilities of the Extremities, Springfield, Ill., Charles C Thomas, 1952.
6. Appleton, A. B.; Hamilton, W. J., and Simon, G.: Surface and Radiological Anatomy for Students and General Practitioners, ed. 3, Baltimore, The Williams & Wilkins Company, 1949.
7. Grant, J. C. Boileau: A Method of Anatomy, ed. 4, Baltimore, The Williams & Wilkins Company, 1948.

SUCCESS IS THE KEYNOTE

of our meeting this year! An interesting and scientific exhibit will contribute much to our success. In addition to the tremendous value of these exhibits, *you* have the opportunity to be considered for one of the coveted awards. Requests for applications for scientific exhibit space in connection with the 34th annual session scheduled for September 9-14, 1956, The Ambassador, Atlantic City, N. J., are now being received. Address all communications to the American Congress of Physical Medicine and Rehabilitation, 30 N. Michigan Ave., Chicago 2, Illinois.

Relationship of the Tilt of the Pelvis to Stable Posture

Frederic J. Kottke, M.D.
and
William G. Kubicek, Ph.D.
Minneapolis

The importance of complete extension of the hip for stable standing posture appears not to have been recognized in much of the current literature on posture. Hellebrandt has stated that the pelvic inclination with the compensatory lordosis is the most important single factor in determining the erect posture.[1] Mommsen,[2] and Kelton and Wright,[3] pointed out that in normal relaxed standing the hips are extended to the limit allowed by the fascia and iliofemoral ligaments. Reynolds and Hooton[4] concluded that anterior tilt of the pelvis displaced the center of gravity anterior to the center of the acetabulum. From a number of the methods of measurement of hip extension published in recent years,[5-8] which indicate that the hip can hyperextend 15 to 45 degrees beyond the standing position of 180 degrees, it would appear that the hip cannot be in complete extension during normal standing. Therefore, standing should require continual muscular action to balance the superincumbent weight on the femoral heads. This conclusion has been rather generally accepted and our thinking about posture has usually been influenced by it.

The study reported by Mundale[9] demonstrates that the hips are in maximal extension during normal relaxed standing. Extension beyond this point occurs only when additional force is exerted adequate to overcome the passive elastic force of the iliofemoral ligaments and fascia. Forward inclination of the pelvis in the sagittal plane or pelvic tilt depends on the tightness of the flexor ligaments and the fascia of the flexor muscles of the hip joints. The tilt of the pelvis affects the position of the center of gravity of the superincumbent body mass, of the head, arms, and trunk (HAT). It is the purpose of this paper to consider the influence of the tilt of the pelvis on stability and balance in the sagittal plane during standing and walking.

Methods of Measuring Hip Extension

It is necessary, in order to evaluate the influence of hip extension and pelvic tilt on stable posture, that we have an accurate method of measuring hip extension. The common method, that of measuring the angle formed by the line of the femur and the line of the torso or the line of the table on which the patient is lying, is so inexact that it is not quantitative. Compensatory motion in the lumbar spine can obscure marked limitation of hip extension. The Thomas test for hip extension requires normal mobility of the opposite hip and of the back in order to be quantitative. Even then, the amount of lumbosacral flexion forced on the patient will influence the apparent hip extension. Milch's method of measuring hip extension is more exact but has not been adopted generally. The angle measured is not easy to visualize. The method reported by Mundale[9] is easy to use in the standing or recumbent position and gives a reading that is readily visualized as a weight-bearing angle (fig. 1).

Normal Relaxed Standing

Normal standing posture is maintained as unstable balance. During standing the body normally sways on the ankles with a shift in the anteroposterior position of the center of gravity that may vary from 0.7 to 2.7 cm.[10] This motion is controlled by the activity of the soleus or the anterior tibial muscles, which contract inter-

Read at the Thirty-third Annual Session of the American Congress of Physical Medicine and Rehabilitation, Detroit, September 1, 1955.

From the Department of Physical Medicine and Rehabilitation, University of Minnesota Medical School.

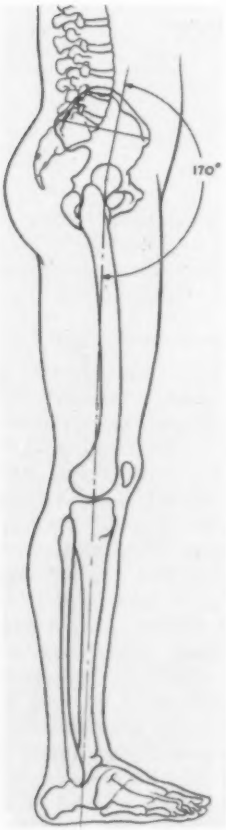


Fig. 1. — Normal extension of the hip. The angle formed by the longitudinal axis of the pelvis and the longitudinal axis of the femur during normal standing is 170 degrees.

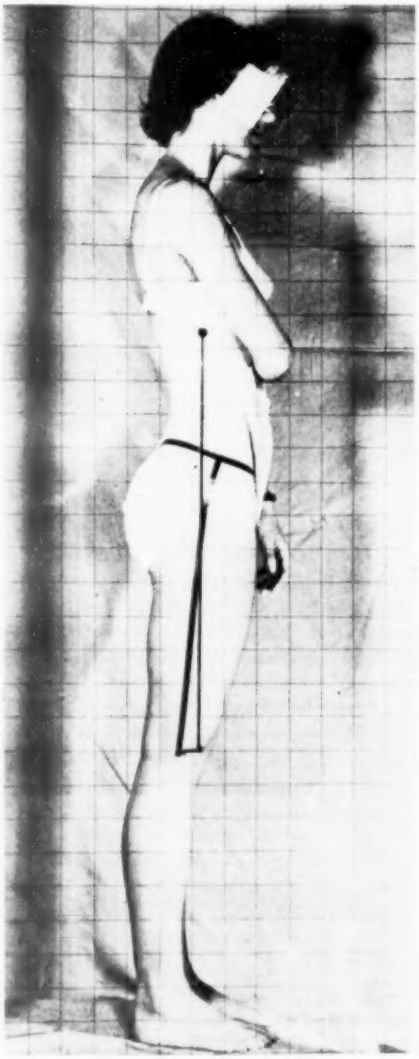


Fig. 2 — During normal standing the center of gravity of the superincumbent weight HAT falls just posterior to the center of the hip joint and well in front of the knee joint so that both hip and knee are held in extension without muscular effort. The torque provided by the superincumbent weight to extend the hip is 26 pound-inches, and the torque to extend the knee is 157 pound-inches. The patient is standing behind a 2-inch grid.

mittently to restore balance.[3] The knees and the hips also must be held extended by muscular force or by the properly positioned weight of the body. Since the knees flex backward and the hips flex forward, if the center of gravity of the superimposed body mass falls between them, both will be held in extension. This is the situation in normal relaxed standing (fig. 2). The center of gravity of the entire body is located at the level of the second sacral vertebra just superior and posterior to the center of rotation of the hip.[11] The center of gravity of the suprafemoral mass, the head, arms, and trunk, which makes up approximately 60 per cent of the weight of the body, is located a distance of 69 per cent of the functional length of the thigh above the hip center.[11, 12] Du Bois-Reymond found the center of gravity of HAT to lie 9 mm. posterior to the hip center during relaxed standing.[13] The line of the weight-bearing thigh is not vertical, but rather slants forward from

knee to hip so that the center of gravity of HAT falls posterior to the hip and anterior to the knee and locks both in extension. Therefore, in normal relaxed standing, ligaments rather than muscles support both hip and knee without consumption of energy.

When the center of gravity of HAT is posterior to the hip joint, the stability of this joint may be measured as the rotational force or torque caused by gravity, which tends to keep this joint locked. In figure 2, if the center of gravity falls ⅜ inch posterior to the center of the femoral head, and the superincumbent weight is 70 pounds, the torque producing and maintaining hip extension is 26 pound-inches (29.4 kg.-cm.). Likewise, the force providing stability to knee extension is approximately 157 pound-inches (178 kg.-cm.). Stability at these joints, therefore, does not depend on balance resulting from muscular contraction across a joint that can collapse in either direction, but rather is provided by a strong torque that must be overcome before the joint can be flexed.

Abnormal Posture

In order to provide stability of the hips without expenditure of muscular energy, it is necessary to maintain the center of gravity posterior to the hip joint. If the hip extends to 180 degrees, this can be accomplished with ease. If tightness of the ligaments or fascia of the flexors of the hips is present, the pelvis is tilted and the superincumbent weight is shifted forward. To regain a position of stability, hyperextension of the lumbar spine is necessary. The greater the tilt of the pelvis, the greater must be the compensatory lordosis (fig. 3). If the center of gravity of HAT during maximal hip extension falls anterior to the hip, extension must be maintained by muscular effort or the hip will collapse. When a person stands with a marked lordosis, the legs are more vertical than during normal stance. If the hip is vertically above the knee, both hip and knee cannot be locked by the weight of the body. If the knee is anterior to the hip, with the center of gravity falling between them, the weight of HAT will unlock both joints.

Children or young adults have enough flexibility of the lumbar spine to develop a compensatory lordosis if tightness of the flexors of the hips should develop. Older adults may have lost the mobility of the lumbar spine which allows an adequate compensatory lordosis. These patients may have a virtually flat back. Consequently, if hip extension becomes limited, the center of mass is far anterior to the hip joint. They can stand only if they have very strong hip extensors or if anterior support is supplied by a cane, crutch, or rail. In essence they have assumed the stance of a quadruped.

Hemiplegic Posture

A number of types of disability commonly have as the major problem contracture of the hip flexors and a pelvic tilt that interferes with standing and walking. A pelvic tilt often develops in patients, after cerebrovascular accidents resulting in hemiplegia. Spasticity, prolonged inactivity in bed, and prolonged sitting all contribute to the development of the pelvic tilt (fig. 4). The typical hemiplegic posture is one of knee and hip extension to approximately 140 degrees. The patient lacks the mobility in the lumbar spine to develop a compensatory lordosis so the center of gravity of HAT is far anterior to the hip. The weight of HAT produces a torque, causing flexion of the hips unless the extensors are strong. The knee also is unstable because a strong flexing torque is exerted when the center of gravity is shifted posterior to the knee in an attempt to extend and lock the hip. Such a patient needs a broad anterior base for support in order to walk. He must put a great deal of weight on his hands. He tires easily. Unless the tilt of the pelvis can be overcome by stretching out the contracture of the hip flexors, his walking will be limited. On the other hand, if he is fortunate enough to retain good control of his hip extensors and they are strengthened by heavy resistance exercise, he will be able to walk in spite of his poor posture.

Abnormal Walking

Support during walking is less stable than during standing. When the sup-

porting leg trails as the patient swings the body forward beyond the supporting leg, the center of gravity lies anterior to the hip and, consequently, will cause the hip to collapse if there is not contraction of the extensor muscles of the hip (fig. 5). The hip is extended as far as possible before reaching 180 degrees and the assumption of the "leg trailing" position is possible only by further tilting of the pelvis and hyperextension of the lumbar spine. This throws the center of gravity of HAT anterior to the axis of motion of the hip, and muscular force is required to maintain hip extension. Patients who have contractures of the hip flexors and weakness of the hip extensor muscles may have adequate compensatory lumbar lordosis to balance while standing, but the hip collapses when the leg trails during walking. Attempts to throw the weight of the body backward, above or behind the hip, merely result in unlocking of the knee. The patient in figure 6 had multiple sclerosis with spasticity of the flexor muscles of the hips and weakness of the

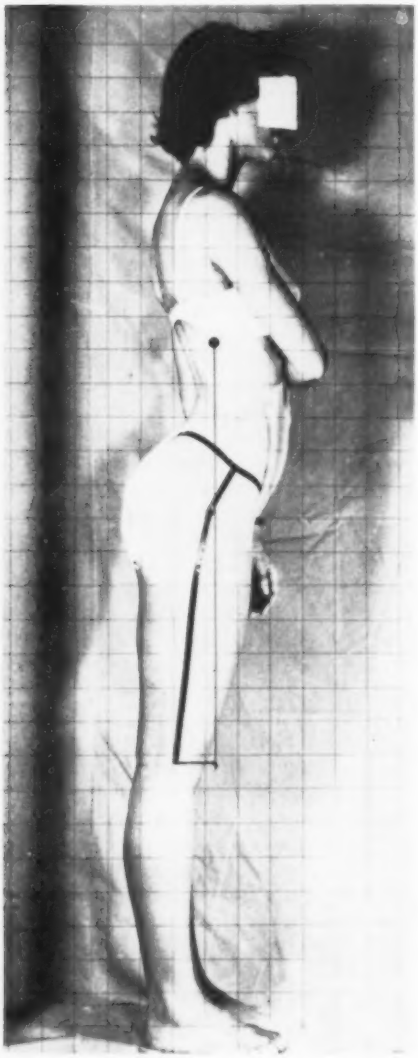


Fig. 3 — When a patient stands with a pelvic tilt and lumbar lordosis the center of gravity of HAT is shifted anterior to the hip. This patient must maintain an extensor torque of 36 pound-inches at the hip by muscular action to prevent flexion.

Fig. 4 — The hemiplegic patient with limitation of hip extension has his center of gravity far anterior to his hip and needs the anterior support of crutch or cane to stand and to walk.

extensors. Six years of spasticity and prolonged sitting in a chair had resulted in limitation of hip extension bilaterally to 130 degrees. After a Yount fasciotomy and vigorous stretching he achieved hip extension to 155 degrees, which enabled him to walk with crutches again. As this patient stands in the bars with the center of gravity of HAT 5 inches anterior to the center of the acetabulum, there is a torque of 360 pound-inches causing flexion of the hip, which must be offset by the contraction of the hip extensors or by weight borne on the hands.

Another common sight in a rehabilitation center is the patient with rheuma-

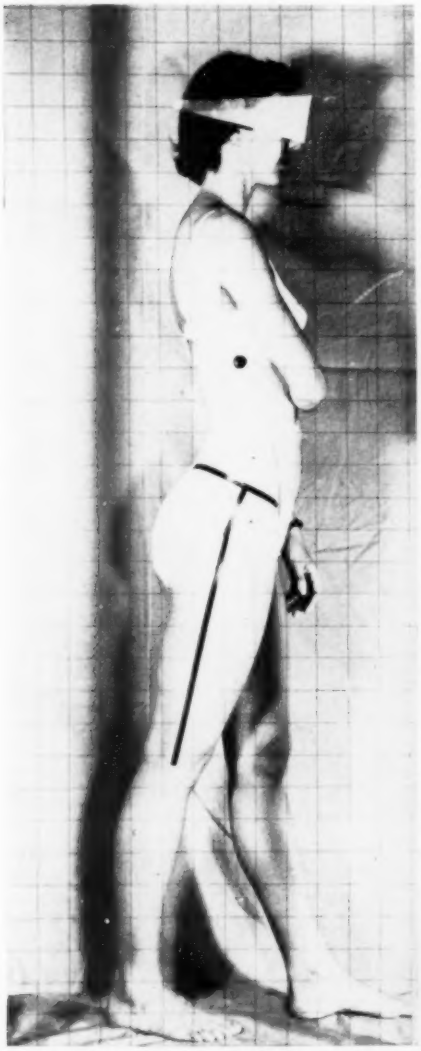


Fig. 5 — During walking the center of gravity of HAT falls in front of the hip of the trailing leg. If the hip is limited in extension, the center of gravity will fall farther forward and more work by the hip extensor muscles will be necessary.

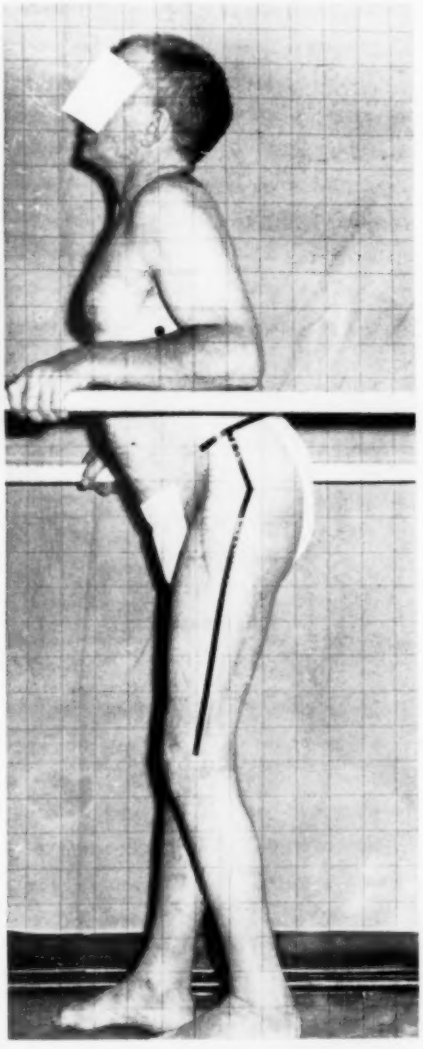


Fig. 6 — Flexor spasticity caused by multiple sclerosis and lack of lumbar lordosis result in a center of gravity of HAT 5 inches in front of the hip. The hip extension was increased from 130 to 155 degrees by a Yount fasciotomy and systematic stretching. It is estimated that this increased extension decreased the torque for hip flexion from 576 pound-inches to 360 pound-inches.

toid arthritis who has developed hip, knee, and ankle flexion contractures together with arthritis in the spine limiting lumbar extension. This patient has all of the handicaps previously described for patients with hip flexion contractures. If he stands and walks, his weight is anterior to the hips and posterior to the knees so that there is a collapsing force on both. Muscular force must be used to counteract the flexor torques caused by gravity. These forces exerted on inflamed joints cause more pain and more wear than would occur in full extension.

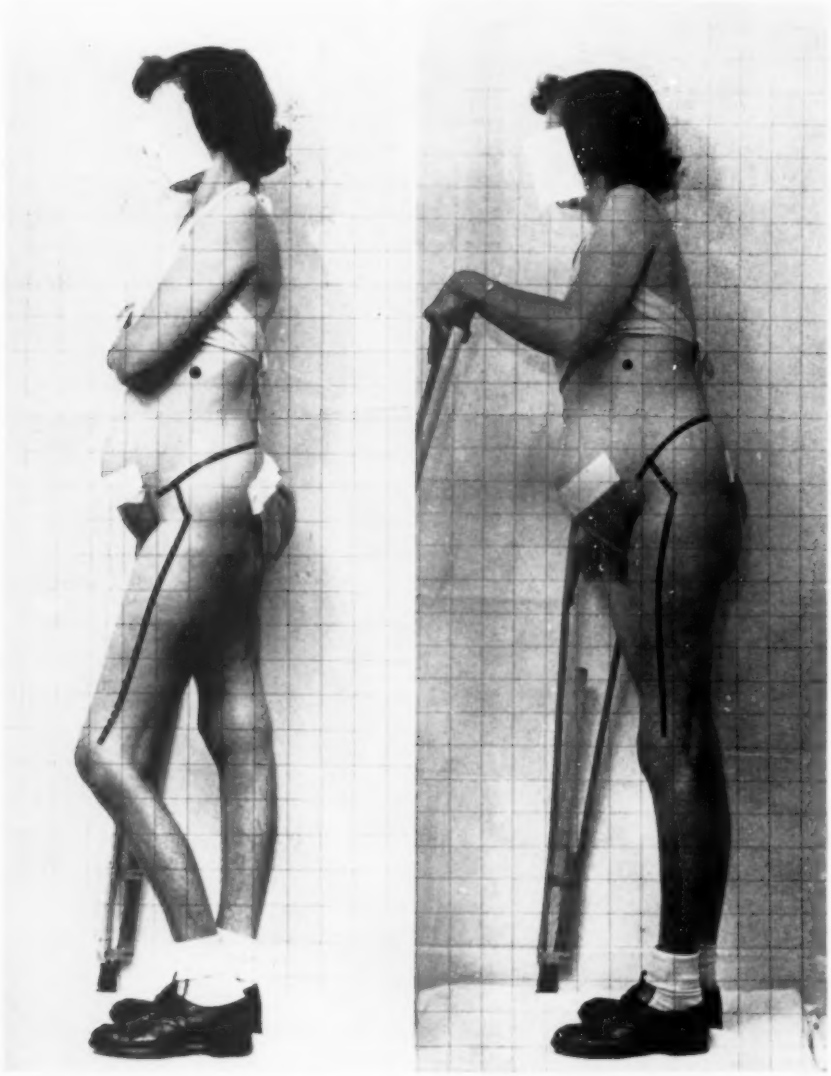


Fig. 7 — The combination of hip flexor tightness and hip extensor and quadriceps weakness produces instability of both hip and knee. The patient stands during relaxation with the left thigh forward because of tightness of the flexor ligaments of the hip. If the hip is extended the pelvis is tilted and the center of gravity of HAT is shifted forward. The hip will collapse if there is not strong anterior support. Attempts to tilt the pelvis backward to force the center of gravity over the hip result in flexing of the knee since the hip is in maximal extension.

Consequently, in addition to the fatigue from over-use of muscles, there will be increased mechanical stress on the joints to aggravate the rheumatoid arthritis.

Figure 7 typifies the posture problem of the patient who has a hip flexion contracture with weak muscles in the torso, hip extensors, and quadriceps. This patient stands in a position of relaxation with the left thigh forward so that the hip flexion contracture does not produce traction and anterior tilt of the pelvis. The hip extends in this patient only to 145 degrees. The same angle is maintained regardless of further extension of the thigh and "extension" is accomplished only by tilt of the pelvis. When she extends the knee completely to bear weight on the left leg, the tilt of the pelvis throws the body forward so that the center of gravity lies 3 inches anterior to her hips, producing a flexing torque at the hip of approximately 250 pound-inches.

The patient who has full hip extension and is able to center his body weight over or posterior to the hip is able to stand and balance with little or no muscular strength and may be able to walk without a long leg brace. Figure 8 shows a patient who has had poliomyelitis involving all four extremities. His back extensors grade poor. He has a flail right lower extremity. In the left lower extremity he has extensors graded poor, adductors graded trace, abductors graded poor, flexors graded trace, quadriceps graded zero and only an outer hamstring graded poor. In addition to that, he has nothing in his left shoulder or arm and only finger flexors in his left hand; however, he is able to stand and balance and also to walk in the parallel bar by using the strength of his right arm to shift the position of the center of weight. Locking of the left hip and the left knee is accomplished by balance because extension of the hip to 170 degrees allows centering of the weight of HAT posterior to the hip and anterior to the knee.

Paraplegic Posture

The paraplegic too stands in a relaxed position only when he has the superincumbent weight of HAT far posterior to the acetabulum so that there is a strong torque locking his hip and giving him stability against jackknifing (fig. 9). The degree of extension of the hips will depend on the tightness or laxity of the iliofemoral ligament, the iliotibial band, and the fascia of the flexor muscles. In many paraplegics these will have been stretched and the patient will stand in what appears to be an undesirably bad

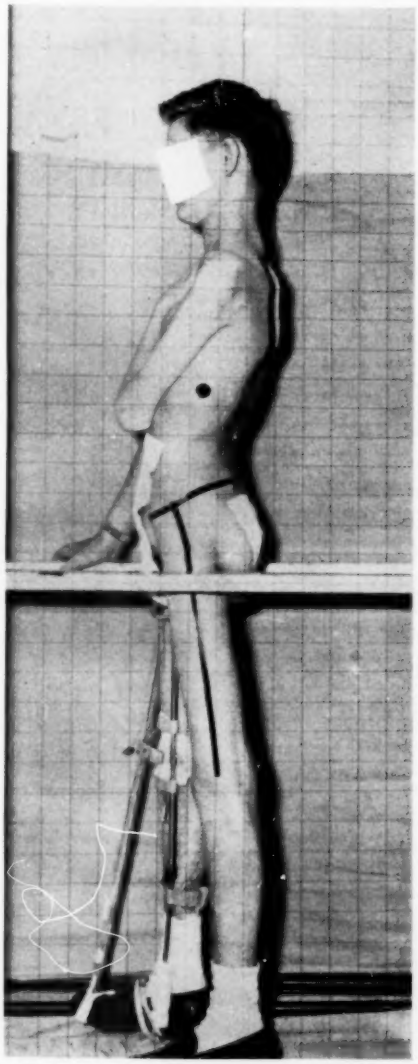


Fig. 8 — The patient who has normal hip extension can stand without muscular effort because the center of gravity of HAT falls posterior to the hip and anterior to the knee.

slump with complete extension of the hips to 180 degrees, lordosis in the lumbar spine, and a rather marked kyphosis in the dorsal spine. Throughout the entire spine and the hips this is a position of relaxation with the patient leaning against the ligaments. This position of relaxation does not require muscular work on the part of the patient. It is a stable position that he can assume for prolonged periods and from which he can carry on reasonable activity while standing. In contrast to this, it is possible for the paraplegic patient to assume a more erect position, which appears to be more nearly the normal position, with

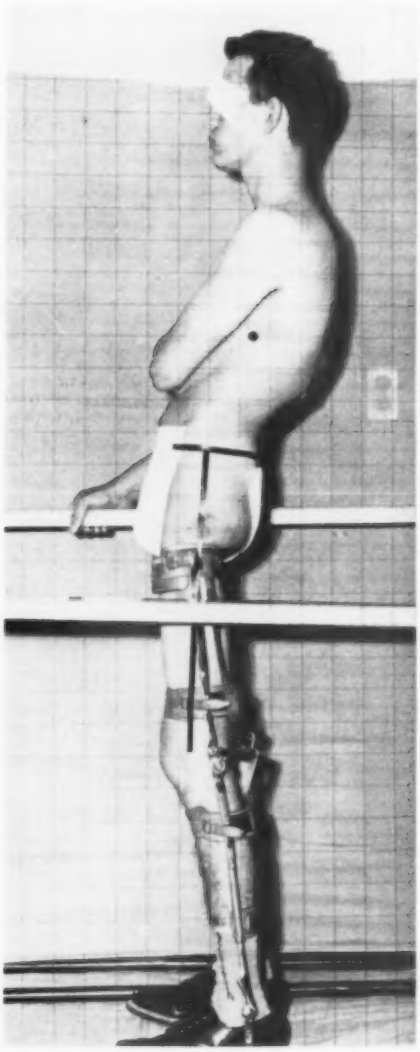


Fig. 9 — The paraplegic patient stands with hips fully extended and the back in lordosis when relaxed. The weight is centered over the ankles. Anteriorly and posteriorly he is supported by ligaments and fascia rather than muscles. This is a stable position that can be maintained for a prolonged period.

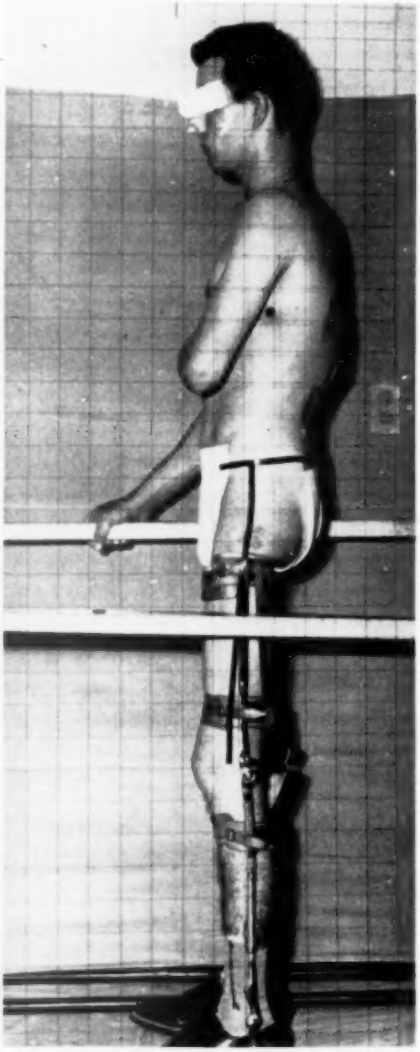


Fig. 10 — If the paraplegic patient stands with his center of gravity close to the center of hip motion the position is unstable and he must use more muscular effort for balance. Flexion of the hip will cause collapse.

slight flexion of the hips and less lumbar lordosis and dorsal kyphosis (fig. 10). In this position the patient's weight is carried very close to the center of rotation of the acetabulum. Slight changes in posture from loss of balance will result in jackknifing of the hips and collapse of the patient. Although this position looks better, it is far less stable and requires more expenditure of energy for balance.

Summary

Under normal conditions of relaxed standing the hip is fully extended and the center of gravity of the body mass above the level of the hip is posterior to the center of the hip joint. This provides a torque, forcing the hip into complete extension and preventing collapse of the hip. The center of gravity of the head, trunk, and arms during normal standing falls posterior to the hips and anterior to the knee causing locking of both joints without muscular contraction. If flexion contractures of the hip occur, the center of gravity of the superincumbent mass is moved anterior to the hip and causes jackknifing of the hips unless the hip extensor muscles are contracted or arm support is used. Hip flexion contractures require muscular energy or braces to be used to keep the knee extended.

Discussion

Charles D. Shields (Washington, D. C.): Good body mechanics implies efficient utilization of intrinsic forces to maintain interaction of segments at rest and in motion.

Pelvic position along with hip and knee extension are altered by the center of gravity of the superimposed body mass. Measurement of some fixed phase of this sequence is essential before we can evaluate the relationship of pelvic tilt to body mechanics.

The angle of the hip joint in extension has probably not been used too frequently in the past because an effective technic had not been established and accepted. We are indebted to Mr. Mundale and co-workers for a method of measurement that has the advantage of using bony landmarks that can be easily located and it has the further advantage that a true angle can be visualized. It is hoped that the method will be accepted widely enough by various operators to establish a true standard or to serve as a basis for an even better technic.

The importance of a measurement of this type has been rightly stressed by Dr. Kottke and co-workers in his splendid analysis of the mechanics of pelvic tilt in relation to stable posture. In dealing with alterations in body mechanics the physician must have the concept of fundamental principles that Dr. Kottke has reviewed.

I wish to congratulate particularly the authors for the selection of concise and enlightening diagrams.

References

1. Hellebrandt, F. A., and Franseen, E. B.: Physiological Study of the Vertical Stance of Man. Physiol. Rev. 23:220 (July) 1943.
2. Mommsen, F.: Die Sicherung des Kniegelenkes bei Amputationen und Lahmungen. Ztschr. f. orthop. Chir. 50:734 (Nov. 13) 1928.
3. Kelton, I. W., and Wright, R. D.: The Mechanism of Easy Standing by Man. Australian J. Exper. Biol. & M. Sc. 27: 505 (Sept.) 1949.
4. Reynolds, E., and Hooton, E. A.: Relation of the Pelvis to Erect Posture. Am. J. Phys. Anthropol. 21:253 (April-June) 1936.
5. Wiechec, F. J., and Krusen, F. H.: A New Method of Joint Measurement and a Review of the Literature. Am. J. Surg. 43:659 (Mar.) 1939.
6. West, C. C.: Measurement of Joint Motion. Arch. Phys. Med. 26:414 (July) 1945.
7. Moore, M. L.: The Measurement of Joint Motion; II: Technic of Goniometry. Phys. Therapy Rev. 29:256 (June) 1949.
8. Rice, C. O.: Calculation of Industrial Disabilities of the Extremities. Springfield, Ill., Charles C Thomas, 1952.
9. Mundale, M. O.; Hislop, H. J.; Rabideau, R. J., and Kottke, F. J.: Evaluation of Extension of the Hip. Arch. Phys. Med. & Rehab. 37:75 (Feb.) 1956.
10. Hellebrandt, F. A., and Braun, G. L.: The Influence of Sex and Age on the Postural Sway of Man. Am. J. Phys. Anthropol. 24:347 (Jan.-Mar.) 1939.
11. Braune, W., and Fischer, O.: Über den Schwerpunkt des menschlichen Korpers mit Ruecksicht auf die Ausruestung des deutschen Infanteristen. Abh. d. Kgl. Sachs Ges. de Wissensch. Math. Phys. Klasse. 26:561, 1889.

12. Elftmann, H.: The Functional Structure of the Lower Limb, in Klopsteg, P. E., and Wilson, P. D., eds., Human Limbs and Their Substitutes, New York, McGraw-Hill, 1954, pp. 411-435.

13. du Bois-Reymond, R.: Spezielle Bewegungslehre mid Überblick über die Physiologie der Gelenke, in Nagel, W., ed., Handbuch der Physiologie des Menschen, Braunschweig, 1909, pp. 564-628.

Effects of Ultrasound of High Intensity on Cellular Structures

Justus F. Lehmann, M.D.[1]
Edward J. Baldes, Ph.D.[2]
and
Frank H. Krusen, M.D.[3]
Rochester, Minn.

Ultrasound of high intensity has been used recently for diagnostic and therapeutic purposes. Fry and associates[1, 2] used a focused ultrasonic beam to produce pin-point lesions in the central nervous system of animals in order to study the resulting physiologic effects. In these experiments Fry applied pulses of ultrasonic energy of a duration of 0.5 to 10 seconds, and of an intensity of 50 to 1,000 watts per square centimeter, at a frequency of 1 megacycle per second. Wild and Reid,[3, 4] on the other hand, made an attempt to localize and diagnose tumors by analyzing the pattern of the ultrasonic waves reflected by the lesions. They also used impulses of a high intensity, 644 watts per square centimeter, and of a short duration, 0.5 microseconds, at a frequency of 15 megacycles per second. Lindstrom[5] attempted to use ultrasound of high intensity as a substitute for frontal lobotomy. This method was said to be as efficient as operation. Also, the dura did not have to be opened, and convulsions occurred less often than in patients treated by surgical methods.

The mode of action of ultrasound of high intensity as used in these investigations has not yet been clarified. Fry and associates[1, 6, 7] concluded from extensive experimental work that under the given conditions, they probably dealt with a nonthermal reaction of unknown origin.

Whereas it has been established[8-12] that under therapeutic conditions ultrasound of low intensity mainly produced biologic effects by heating the tissues, little is known about what happens in the tissues when ultrasound of high intensity is applied. The mode of action of ultrasonic energy is unknown under these conditions, and our knowledge is also incomplete concerning the alterations of cellular structure and function that are produced by ultrasound of high intensity. Therefore, experimental investigations on the biologic effects of ultrasound of high intensity and its mode of action seemed to be justified since better knowledge of these phenomena could be expected to improve the therapeutic and diagnostic results. In addition, it was hoped that such investigations might perhaps give information on a nonthermal reaction that could be used for destruction of tumor tissues.[13]

Read at the Thirty-third Annual Session of the American Congress of Physical Medicine and Rehabilitation, Detroit, August 30, 1955.

[1]Fellow in Physical Medicine and Rehabilitation, Mayo Foundation; now, Department of Physical Medicine and Rehabilitation, Ohio State University Hospital, Columbus.

[2]Section of Biophysics and Biophysical Research, Mayo Clinic and Mayo Foundation.

[3]Section of Physical Medicine and Rehabilitation, Mayo Clinic and Mayo Foundation.

Abridgment of portion of thesis submitted by Dr. Lehmann to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Physical Medicine and Rehabilitation.

The Mayo Foundation, Rochester, Minn., is part of the Graduate School of the University of Minnesota.

Methods

The ultrasonic frequency used in our experiments was 1 megacycle. The beam was focused with a polystyrene lens.[14-17] The intensity in the focal area was 11 times that of the unfocused beam in the same area. The absolute intensity at the focus was about 110 watts per square centimeter. The focal area had a diameter of approximately 0.5 to 1 mm. The focal intensity was measured with calibrated thermocouple probes. The gain of intensity that was obtained by inserting the focusing lens was determined at low intensities with the same probe.[15, 18] The absolute intensity was then calculated for full output of the generator after it had been demonstrated that the increase of focal intensity was in direct proportion to the increase of the output of the machine if cavitation were prevented. Water was used as the coupling medium after it had been carefully degassed by boiling. The temperature of the water was kept constant at 0 to 3 C. by inserting melting ice in separate containers.

The tissues of growing roots of onions were used as subjects of investigations. The advantages of this material are that the detailed cellular structures can be observed with comparative ease, and the tissue structure is fairly uniform and not complicated by the presence of blood vessels. Finally, the effects of ultrasound of low intensity and those produced by cavitation or related phenomena have been previously studied in this material.[19-21]

The tips of the roots were exposed to ultrasonic energy in the focus of the beam for 5 minutes. This was done under a pressure of 450 pounds per square inch, which had been built up prior to the exposure during a period of 15 minutes. This pressure was considerably higher than the pressure amplitude in ultrasound waves at the intensities used. It is said, therefore, to prevent cavitation.[15, 21] After the exposure to ultrasound, the pressure was reduced to atmospheric conditions during 30 minutes. Then, the roots were cut off the bulb, and microscopic slides were prepared as described previously.[20] The position of focus and the ultrasonic intensity were checked after each experiment.

The temperature in the onion roots was measured with thermocouples made of 0.005-inch steel and 0.003-inch constantan wires. It could be assumed that the temperatures measured with these probes were close to the true temperatures within the onion roots since the conduction of heat by these wires is less than that of the onion tissue. The thermocouple was placed along the long axis of the root so that the soldered junction was inserted at the center of the tip of the root within the focal area. The measurements were made at low ultrasonic intensities. After it had been demonstrated that the difference between the temperature of the water bath and that in the onion root was approximately proportional to the output of the ultrasound generator, the temperatures at the high intensity of 110 watts per square centimeter were obtained by extrapolation. Since the high pressure exerted on the roots pushed them over the tip of the thermocouple into the water, only a few direct measurements of temperature could be obtained at high intensities.

Experiments

In a series of experiments, the tips of the onion roots were exposed to the focused ultrasonic energy under pressure. As a result a zone of almost complete destruction developed within the center of the tip of the root. This area was approximately 0.5 mm. in diameter and was filled with an almost homogeneous mass of granular debris interspersed with a few nuclear fragments. The destruction of the cells at the center of the area was as complete as it was at the edges, where it ended abruptly. The main structures of the few outer layers of cells of the onion root were fairly well preserved with the exception of some definite pyknosis of the nuclei, and shrinkage and vacuolization of the protoplasm (figs. 1 and 2). Roots used as controls were inserted into the water and were exposed to the same temperatures and pressures for the same period as the roots exposed to ultrasound. These controls showed an entirely normal cellular struc-

ture (fig. 3). These experiments were repeated nine times with the same results.

The temperatures within the roots were measured in another series of 14 experiments. The rise of temperature above that of the water bath of the onion root on exposure to ultrasound was calculated to be 154 C. ($\sigma = 34.4$ C.).

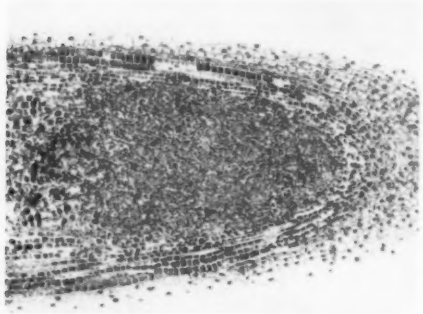


Fig. 1. Uniform destruction of the center of the onion root after exposure to ultrasonic energy (110 watts per square centimeter). Shrinkage and vacuolization of nuclei and plasma at the edges of the root (Heidenhain's iron hematoxylin; about 60x.)

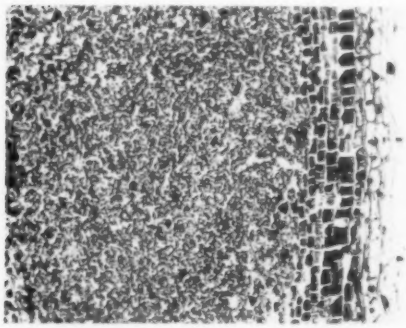


Fig. 2. Edge and center of root after exposure to ultrasound as in figure 1 (Heidenhain's iron hematoxylin; about 130x).

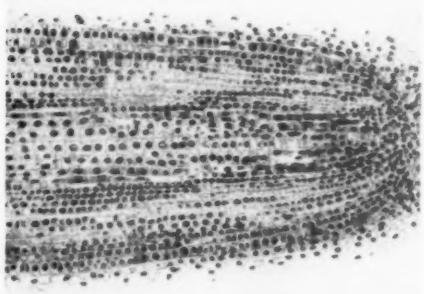


Fig. 3. Control; intact cellular structures and mitotic figures (Heidenhain's iron hematoxylin; about 80x).

In another series of nine experiments, the rise in temperature within the roots was recorded with a kymograph. The average rate at which the temperature rose was measured at one-tenth of the original focal intensity by first determining the period from the onset of exposure to ultrasound until 90 per cent of the final temperature within the root was obtained. Then, the rise in temperature (representing 90 per cent of the final temperature) was divided by the seconds that had elapsed. The rate of the rise of temperature thus estimated was about 30 C. per second.

Next, the effects of heat of a range corresponding to that produced by ultrasound were studied. As in the experiments with ultrasound, the onion roots were first inserted into ice water and then heated for 5 minutes by submerging them quickly into a water bath of 60 to 80 C. (figs. 4 and 5), or mineral oil of 208 C. Next they were re-inserted into the ice water and then fixed. In other words, the sequence of events was the same as that of the experiments with ultrasound, with two exceptions — the rise of temperature was produced by other means, and the experiments were performed under atmospheric pressure. The range of temperatures thus obtained included that produced in the roots by exposure to ultrasound. The observed histologic changes were rather uniform and consisted of shrinkage of nuclei and plasma, and some vacuolization of the plasma. This reaction was essentially identical with that observed at the edges of the root after exposure to ultrasound. In addition boiling and sputtering of the fluids within the roots occurred at the temperature of 208 C. As a result, the histologic equivalent of this seemed to be empty spaces within the root tip where the tissues were torn or pushed aside (fig. 6). No reaction was observed that showed any resemblance to the uniform destruction that has been found in the centers of the roots after exposure to ultrasound of high intensity (figs. 1 and 2).

Comment

The histologic appearance of plant tissues was studied after exposure to ultrasound of high intensity. The centers of the root tips that were inserted into the focal area were completely destroyed. The destruction was rather uniform and sharply outlined. There was almost no intermediate degree of damage between the layers of cells at the outer portion of the root and the uniform fine granular debris in the center of the root. The outer layers of cells exhibited a fairly well-preserved gross structure; however, they also were altered. Most nuclei were pyknotic and shrunken, and the protoplasm showed vacuolization or shrinkage. This appearance differed from that of similar tissues after exposure to low ultrasonic intensities in which the reaction was considered to result from cavitation or degassing.[19, 21] In such reactions the destruction was most severe in the center of the area of damage and subsided rather quickly toward the periphery.

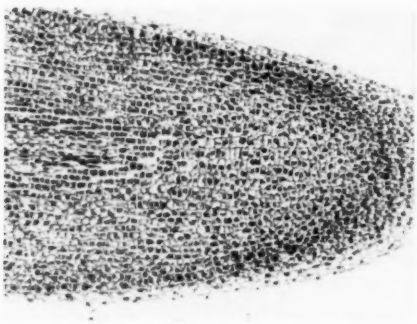


Fig. 4. Reaction with shrinkage and vacuolization of nuclei and plasma after exposure to temperature of 80 C. (Heidenhain's iron hematoxylin; about 60x).

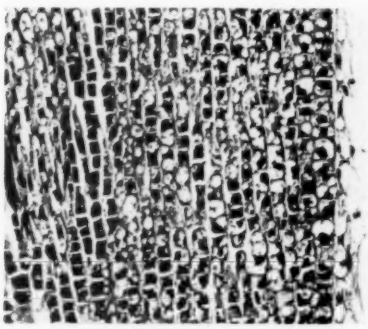


Fig. 5. Edge and center of root after exposure to temperature of 80 C. as in figure 4 (Heidenhain's iron hematoxylin; about 130x).

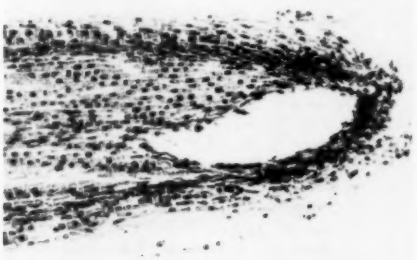


Fig. 6. Reaction with shrinkage and vacuolization of nuclei and plasma after exposure to temperature of 208 C. In the center of the root the tissue is torn and partially pushed aside (Heidenhain's iron hematoxylin; about 65x).

The reactions to ultrasound of high intensity also differed from reactions to temperatures ranging from 60 to 208 C. If previous experiments[20] are included, this range of temperature can be extended down to 40 C. Such temperatures produced histologic changes that consisted mainly of shrinkage and pyknosis of nuclei, and vacuolization and shrinkage of the protoplasm. In other words, the changes closely resembled those in the outer layers of cells of the onion root after exposure to ultrasound of high intensity, but were completely different from the uniform destruction found in the center of the root after such exposure. If the roots were exposed to very high temperatures (208 C.), and if boiling of the cellular fluids, sputtering, and evaporation suddenly occurred, the histologic appearance was essentially the same as in the other experiments with exposure to heat, except that empty spaces were found in the tissues where they were torn and some layers of cells pushed to the other side. This appearance was also entirely different from that observed after exposure to ultrasound of high intensity.

The histologic appearance, therefore, suggests that the reaction to exposure to high-intensity ultrasound is brought about neither by the rise of temperature that occurs as a result of the absorption of ultrasonic energy nor by cavitation or

degassing phenomena, as they have been observed at lower intensities.[19-21]

At present, the mode of action of ultrasound of high intensity on plant tissues is unknown. Only a few facts are known. The rise of temperature within the tissues occurs quickly and exceedingly high temperatures are obtained. In other words, these experiments suggest that no matter what else might happen in the tissues, the temperature developed is more than enough to produce biologic reactions and destructive lesions. As a matter of fact, the outer edge of the onion root exposed to ultrasound of high intensity had the same appearance as roots exposed to high temperatures.

The reactions to ultrasound of high intensity were different from those of cavitation or degassing produced at lower intensities. Also, the fact that they occurred under pressure exceeding the pressure amplitude of the ultrasound waves might perhaps be interpreted as suggesting that it was not caused by phenomena of cavitation. This is true, at least, if it is assumed that the occurrence of cavitation is prevented by such pressures, and if the pressure was high enough to prevent boiling of the tissue fluids in spite of the pronounced rise of temperature. As a matter of fact, the boiling point of water (237 C.) under pressure of 450 pounds per square inch was higher than any temperature measured in the onion roots in the experiments with ultrasound of high intensity. On the other hand, it is possible that the sudden rise of temperature during exposure to ultrasound might facilitate the occurrence of degassing. Thus, degassing might perhaps be produced by ultrasound in spite of the applied pressure of 450 pounds per square inch.

Summary

The roots of onions were exposed to ultrasonic intensities of approximately 110 watts per square centimeter. Complete and uniform destruction of the center of the root was observed. The histologic reaction was different from that produced by heat and also from the phenomena of cavitation produced by ultrasound of lower intensities. This and the fact that the reactions occurred under high pressure might perhaps be interpreted as suggesting that the destructive lesions were not caused by cavitation or heat alone. On the other hand, temperatures of approximately 150 C. were estimated within the tissues during exposure to ultrasound, which could produce destructive lesions alone no matter what else might have happened to the tissues during the exposure to ultrasound.

It seems likely that the reaction to ultrasound of high intensity may include a nonthermal noncavitation reaction, the mechanism of which can only be speculated upon.

References

1. Fry, W. J.: Action of Ultrasound on Nerve Tissue — A Review. J. Acoust. Soc. America 25:1, 1953.
2. Fry, W. J.; Mosberg, W. H., Jr.; Barnard, J. W., and Fry, F. J.: Production of Focal Destructive Lesions in the Central Nervous System with Ultrasound. J. Neurosurg. 11:471 (Sept.) 1954.
3. Wild, J. J., and Reid, J. M.: The Effects of Biological Tissues on 15-Mc Pulsed Ultrasound. J. Acoust. Soc. America 25:270, 1953.
4. Wild, J. J., and Reid, J. M.: Application of Echo-Ranging Techniques to the Determination of Structure of Biological Tissues. Science 115:226 (Feb. 29) 1952.
5. Lindstrom, P.: Paper read before annual congress, American Institute of Ultrasound, Sept., 1954.
6. Fry, W. J.: Mechanism of Acoustic Absorption in Tissue. J. Acoust. Soc. America 24:412, 1952.
7. Wall, P. D.; Tucker, D.; Fry, F. J., and Mosberg, W. H.: The Use of High Intensity Ultrasound in Experimental Neurology. J. Acoust. Soc. America 25:281, 1953.
8. Wakim, K. G.: Ultrasonic Energy as Applied to Medicine. Am. J. Phys. Med. 32:32 (Feb.) 1953.
9. Fischer, E.: Basic Biological Effects of Ultrasonic Energy. Am. J. Phys. Med. 33:174 (June) 1954.
10. Hueter, T. F.: On the Mechanism of Biological Effects Produced by Ultrasound. Chemical Engineering Progress Symposium, Series Vol. 47, 1:57, 1951.
11. Lehmann, J. F.: The Biophysical Basis of Biologic Ultrasonic Reactions with Special Reference to Ultrasonic Therapy. Arch. Phys. Med. 34:139 (Mar.) 1953.
12. Lehmann, J. F.: The Biophysical Mode of Action of Biologic and Therapeutic Ultrasonic Reactions. J. Acoust. Soc. America 25:17, 1953.

13. Lehmann, J. F., and Krusen, F. H.: Biophysical Effects of Ultrasonic Energy on Carcinoma and Their Possible Significance. Arch. Phys. Med. 36:452 (July) 1955.
14. Sette, D.: Ultrasonic Lenses of Plastic Materials. J. Acoust. Soc. America 21: 375, 1949.
15. Bergmann, L.: Der Ultraschall und seine Anwendung in Wissenschaft und Technik. Zürich, S. Hirzel, 1949. p. 676.
16. Barone, A.: Aspects of the Concentration of Ultrasonic Energy. Acustica 2:221, 1952.
17. Bronzo, J. A., and Anderson, J. M.: The Effectiveness of Plastic Focusing Lenses with High Intensity Ultrasonic Radiation. J. Acoust. Soc. America, 24:718, 1952.
18. Fry, W. J., and Fry, R. B.: Determination of Absolute Sound Levels and Acoustic Absorption Coefficients by Thermocouple Probes — Experiment. J. Acoust. Soc. America 26:311, 1954.
19. Hug, O., and Pape, R.: Nachweis der Ultraschallkavitation im Gewebe Strahlentherapie 94:79, 1954.
20. Lehmann, J. F.; Herrick, J. F., and Krusen, F. H.: The Effects of Ultrasound on Chromosomes, Nuclei and Other Structures of the Cells in Plant Tissues. Arch. Phys. Med. 35:141 (Mar.) 1954.
21. Lehmann, J. F., and Herrick, J. F.: Biologic Reactions to Cavitation, a Consideration for Ultrasonic Therapy. Arch. Phys. Med. 34:86 (Feb.) 1953.

CHICAGO SOCIETY OF PHYSICAL MEDICINE AND REHABILITATION

Date: March 14, 1956

Place: Chicago Medical School, 710 S. Wolcott St., Chicago

Subject: Clinical Correlations in Cerebral Palsy

Speaker: Meyer A. Perlstein, M.D.

Time: 8:00 p.m.

Further details concerning these meetings may be had from the Secretary, Ralph E. DeForest, M.D., 535 N. Dearborn St., Chicago 10, Ill.

An Assignment

W. W. Young, M.D.
and
Edwin B. Augustin, M.A., R.P.T.
Butler, Pa.

In May, 1953, a rehabilitation ward was established at the VA Hospital in Butler, Pa. This institution deals exclusively with tuberculosis. Consequently, the Physical Therapy Section became distinctly involved to a degree that we believe is unique in the experience of the physical therapist. The degree of involvement was a direct result of decisions made locally by the medical authorities. It is the purpose of this paper to deal in detail with the results of those decisions as they affected the Physical Therapy Section.

Over-All Goal

The over-all goal was to provide opportunity for the great majority of patients to acquire during their residence on the rehabilitation ward an activity tolerance equivalent to an 8-hour-day work tolerance at the date of discharge. Of course there is little specificity in the term "8-hour-day work tolerance," since the tolerance necessary for a clerk and for an unskilled laborer in a steel mill, for instance, differs widely; therefore, the 8-hour day referred to is a mean of these two extremes. It would permit the dischargee to qualify physically for a full day's work in all but the most demanding type of employment. That day would also include the customary time spent in transportation, eating, and self-care, with sufficient activity to permit some social life.

Program Organization

In order to provide opportunities to acquire this tolerance, the rehabilitation service had available the four sections which comprise it: Educational Therapy, Manual Arts Therapy, Occupational Therapy, and Physical Therapy. Ancillary help was provided by the personnel and facilities of the Special Services Section. Each of these five units was called upon to contribute to the total activity tolerance. This report explains how the Physical Therapy Section carried out its assignment.

It was determined that approximately four months would be the average time required for all but the exceptional patient to gain the necessary activity tolerance, and that the program would begin with patients in class V. As the regulations recognize class VI and class VII, it was necessary to create for our immediate needs an additional class which is referred to locally as class VIII. Promotions from one class to another are made at monthly intervals and are effected by a conference of representatives of the Tuberculosis Service and the Chief, Physical Medicine and Rehabilitation Service. Discharges are effected by the action of a board composed of the tuberculosis staff and the Chief, Physical Medicine and Rehabilitation Service. Sufficient individualization is possible to permit certain patients to be advanced more rapidly, and others more slowly. Such determinations are arrived at on the basis of the medical and surgical aspects of the case. Other factors — economic, educational, and psychological — frequently influence decisions.

The physical therapy section was called upon to provide the patient with by far the greatest amount of activity tolerance. This was made possible by the fortuitous circumstance that this particular installation was equipped with a gymnasium and extensive grounds. It was realized by all concerned that the course of rehabilitation decided upon was revolutionary; however, those who made the decision can hardly be accused of being other than cautious. Their thinking processes were similar to those that had been employed by others in the

Chief, Physical Medicine Service (Dr. Young), and Chief, Physical Therapy, VA Hospital.

treatment of tuberculosis[1-5] and in other fields of medicine and surgery in the early part of the century.

The physical education part of the program starts with the Class VI patient assigned to the physical medicine and rehabilitation section. Thirty minutes of supervised physical activity is prescribed for this patient each day; a similar amount of time is subtracted from the quiet hours. The section chief prescribes this activity only after thoroughly reviewing the case history. When he feels that the chief physical therapist should be informed of some special aspects of the case that would require modification in the activity prescribed, the case is reviewed by both the Chief of the Physical Medicine and Rehabilitation Section and the Chief of Physical Therapy. When the patient is placed in class VII, the activity is increased to one hour a day, and in class VIII to 90 minutes.

The prescription is quantitative in this respect, but it is also qualitative in that the nature of the activities prescribed changes as the patient progresses. They are also modified in keeping with his age, the degree of tuberculosis infection, his vocational objective, and complicating diseases such as arthritis, diabetes, or asthma. It is felt that a progressive acquisition of a maximum activity tolerance in a comparatively short time under the most rigorous supervision has been made available through these measures.

In the first four months of this program, the pulse, respiration, and temperature of patients were taken before they went to the gymnasium, upon their return, and 15 minutes later. A review of these data showed that there were no contraindications to the program. The increase of pulse and respiration was the same as would be found in an ordinary group of men of the same age. Occasionally a patient who was in an undue state of anxiety, which had been a matter of record on admission, displayed an increased anxiety; but psychotherapeutic measures in every instance dealt effectively with these symptoms. In selected patients, bronchospirometry and respiratory reserve studies were done. Patients in whom lobectomy, thoracoplasty, or resection had been performed, and patients with asthma or bronchiectasis were included in this group. Enough of these studies were completed to demonstrate that the respiratory reserve improved even in these patients after a month or so on this program.

When a sufficient number of such studies had been made to assure those responsible that good results were being obtained, they were abandoned as a routine measure. Occasionally appropriate checks and tests are ordered if the circumstances seem to warrant it, such as for a patient with chronic bronchiectasis. This ward does not accept patients with residual cavitation, particularly if such cavities are unilateral, and surgery is possible or has been recommended but has been refused by the patient. This policy is not the result of a feeling that such a patient might break down on the program. It is the result of a conclusion, which has been borne out by experience, that a patient who is so un-cooperative as to refuse surgery will demonstrate this same lack of cooperation in the rehabilitation program. At least a dozen patients who have been transferred to the rehabilitation bed service had bilateral residual cavitation; it has been felt that such patients were not amenable to surgery. All of these patients went through the regular program of physical education without deleterious effects.

Activities Employed

Because we have a gymnasium, an uninterrupted program is possible regardless of weather or seasons; however, during the summer, most of the activities are transferred to the outdoors. The outdoor activities are bicycle riding, horseshoes, golf, softball (modified), hard ball (modified), plug casting, and croquet. Indoor activities are excercising on the incline plane, on the rowing machine, in the sand box (for flat feet), and with wall weights. Also included are weight lifting, rope climbing, calisthenics, punching the light bag, badminton, volleyball, tossing the medicine ball, and basketball. Baseball and basketball are not played on a competitive basis;

the emphasis is upon functional activity and activity tolerance.

Results

Although more than 200 patients have completed this program no bacteriological or x-ray evidence has yet appeared that would incline us to regard the program as other than beneficial. The success of the program can be largely attributed to the efficacy of the medical therapy that the patients received previous to their transfer to the rehabilitation ward and to the judgment of the medical staff in defining patient classification categories, which is the entire basis of the program. The medical aspects of the complete program will be discussed in a future report.

Self Assurance, An Extra Benefit

Although designed originally solely as a means of aiding the patient to acquire activity tolerance, this program provides a feeling of assurance, which may be of equal, if not greater importance. There is a gradual evolution in the attitude of the patient toward this program. In their first visit or so to the gymnasium, they display an understandable apprehension. This is probably the result of many months, or even years, of indoctrination in the active treatment wards. Gradually, they show less apprehension, and then more confidence. Occasionally, some patients must be restrained for they display a tendency toward reckless abandon and overaggressiveness; but very few patients at the time of discharge evidence

Volley Ball

A typical group receiving therapy through volley ball. Participants are as follows:

Patient "A" — admitted 10/19/53 — still resident. Diagnosis: Tuberculosis, pulmonary, moderately advanced, no surgery.

Patient "B" — admitted 9/1/51 — discharged 12/20/54. Diagnosis: Tuberculosis, pulmonary, moderately advanced; Herniorrhaphy, right inguinal, indirect 11/23/54.

Patient "C" — admitted 4/1/54 — discharged 12/21/54. Diagnosis: Tuberculosis, pulmonary, moderately advanced, no surgery.

Patient "D" — admitted 9/1/53 — discharged 12/19/54. Diagnosis: Tuberculosis, pulmonary, minimal, no surgery.

Patient "E" — admitted 11/21/52 — discharged 12/20/54. Diagnosis: Tuberculosis, pulmonary, far-advanced; 7-rib thoracoplasty, right, 3 stages. Initial diagnosis of tuberculosis made in June 1946.

Patient "F" — admitted 1/28/53 — discharged 12/9/54. Diagnosis: Tuberculosis, pulmonary, far-advanced; left lower lobectomy 12/10/53.

Patient "G" — admitted 8/31/53 — still resident. Diagnosis: Tuberculosis, pulmonary, moderately advanced; Diabetes, mellitus; left upper lobectomy; Lingulectomy, April 1954.

Patient "H" — admitted 11/9/53 — still resident. Diagnosis: Tuberculosis, pulmonary, far-advanced; left upper lobectomy, October 1951.

a lack of confidence to face competitive society.

The patient who has been femininely oriented all his life — dominated by a mother or lacking in forcefulness — gains certain masculine attributes which he lacked. The program is an ego builder for such men. In another sense, it is merely an extension of the preoperative and postoperative physical therapy program designed to eliminate or minimize deformities and to develop compensatory mechanisms. It is an extension into the gymnasium of the more limited functional activities that are part of the equipment of every good physical therapy clinic. For the boy who has always felt he did not belong and who is pathetically desirous of being accepted into a group, here is the opportunity for the tactful therapist to help him realize these hopes. In this sense, as in many others, it contributes to the morale of the patient, and through him to the morale of the ward.

This program is to be regarded as an initial effort, a venture into a highly controversial field. We do not claim that this program has written the final word in the chapter. It is undergoing modifications at our hands, and others will no doubt improve upon what we have done; but we believe that it has sufficient merit to warrant its being copied, at least in part, so that other patients may experience its benefits.

References

1. Agur, C. V., and Anderson, C. W.: Post-Hospital Rehabilitation Study of Tuberculosis Patients. Arch. Phys. Med. 35:307 (May) 1954.
2. Bogen, E., and Skillen, J.: The Rehabilitation of Tuberculous Patients Following Major Thoracic Surgical Treatment. Dis. Chest 26:558 (Nov.) 1954.
3. Brieger, E. M.: Assessment of Fitness for Work in Pulmonary Tuberculosis. Tubercle 33:160 (June) 1952.
4. Clarke, O.: Principles and Results of Training and Employment at Papworth. Tubercle 34:206 (Aug.) 1953.
5. Hochhauser, E., and Hentel, C.: History, Philosophy and Operation of Altro Work Shops Inc. Brit. J. Phys. Med. 17:3 (Jan.) 1954.

ARCHIVES AVAILABLE ON MICROFILM

The ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION is now available to libraries on microfilm. A microfilm edition will be sold only to bona fide subscribers of the ARCHIVES, is not for resale and will be distributed at the end of the volume year.

For further information, inquiry should be directed to UNIVERSITY MICROFILMS, 313 North First Street, Ann Arbor, Mich.

CORRESPONDENCE

ACPM&R Passes Resolution

At the 33rd annual meeting of the American Congress of Physical Medicine and Rehabilitation, August 28 — September 2, 1955, Hotel Statler, Detroit, the following resolution was passed and mailed to those listed herein:

WHEREAS, Senate Bill 1951 introduced by Senator Matthew Neely of West Virginia, and fifteen other Senators, and House of Representatives Bill 5465 introduced by Representative Charles E. Bennett of Florida, and similar bills introduced by nineteen other representatives, proposes to establish the Federal Agency for Handicapped which would transfer the functions of the Office of Vocational Rehabilitation in the Department of Health, Education and Welfare to an independent Federal agency placed in the Department of Labor for housekeeping purposes; and

WHEREAS, successful restoration of the handicapped person to fullest physical, mental, social, vocational and economic ability requires the aid of a rehabilitation team working with and under the direction of the physician; and

WHEREAS, the problems of health and welfare, including rehabilitation, are properly administered in the Department of Health, Education and Welfare; therefore, be it

RESOLVED, that the American Congress of Physical Medicine and Rehabilitation in convention assembled, August 30, 1955, go on record as opposing Senate Bill 1951 and House of Representatives Bill 5465 establishing an independent Federal Agency for Handicapped; and be it further

RESOLVED, that the American Congress of Physical Medicine and Rehabilitation recommend that all Federal programs for furthering the rehabilitation of the handicapped should be administered in the Department of Health, Education and Welfare where other kindred programs relating to health, education and welfare are administered and coordination of functions relating to rehabilitation and employment of the handicapped can be most effectively accomplished; and be it further

RESOLVED, that copies of this resolution be forwarded to: President Dwight D. Eisenhower; Senators Frank Carlson, Ralph E. Flanders, Lister Hill, Hubert H. Humphrey, Estes Kefauver, Harley Kilgore, William Langer, Herbert Lehman, Warring Magnuson, Pat McNamara, Wayne Morse, James Murray, Matthew Neely, Richard Neuberger, George Smathers, and John Sparkman; Representatives Cleveland Bailey, Charles Bennett, Charles Buckley, Vera Buchanan, Earl Chudoff, Charles Diggs, Jr., John Dingell, Clyde Doyle, Elizabeth Kee, Augustine Kelley, Coya Knutson, Roy Madden, John McCormack, Joseph O'Hara, Louis Rabout, George Rhodes, John Saylor, Thor Tollefson, and Gardner Withrow; the Secretary of the United States Senate; the Clerk of the House of Representatives; members of the Senate Committee on Labor and Public Welfare; members of the House of Representatives Committee on Education and Labor, and the Secretary of Health, Education and Welfare.

Very truly yours,
AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION
Gordon M. Martin, M.D.
President

In addition to the persons listed in the resolution, the following persons also received a copy of this material: Miss Mary Switzer, Director of the Department of Health, Education and Welfare; Honorable Marion B. Folsom, Secretary of Health, Education and Welfare; Senators Paul Douglas, John Kennedy, Alexander Smith, Irving Ives, William Purtell, Barry Goldwater, George Bender, Gordon Allott; Representatives Graham Barden, Adam Powell, Jr., Carl Perkins, Roy Wier, Carl Elliott, Phil Landrum, Lee Metcalf, James Bowler, Edith Green, James Roosevelt, Herbert Zelenko, Harris B. McDowell, Jr., Stewart Udall, Samuel McConnell, Jr., Ralph Gwinn, Carroll Kearns, Harold Velde, Clare Hoffman, Albert Bosch, Joe Holt, John Rhodes, Stuyvesant Wainwright, Peter Frelinghuysen, Jr., Sam Coon, Orvin Fjare, Frank Thompson, Jr., and Wint Smith.

International Congress of Physical Medicine Receives Contribution

September 21, 1955

Hugh A. Burt, M.D., Honorary Treasurer
International Congress of Physical Medicine
45 Lincoln's Inn Fields
London W.C. 2, England

Dear Doctor Burt:

It gives me great pleasure to tell you that at the annual meeting of the American Congress of Physical Medicine and Rehabilitation, it was the decision of the general membership to contribute the sum of $500 to be used in making arrangements for the meeting of the International Congress of Physical Medicine in 1956. Our check for this amount is enclosed.

Very sincerely yours,
AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION
Dorothea C. Augustin
Executive Secretary

14th October, 1955

Dear Miss Augustin,

Very many thanks for your letter of the 21st September informing me of this kind and generous act of the American Congress of Physical Medicine and Rehabilitation in contributing to the next Congress in Copenhagen and for enclosing the cheque. I am confident that the Danish Committee will be delighted and that it will be a very great help to them. I have written to Dr. Strandberg, the Secretary of the Congress, and forwarded your cheque to him.

Yours sincerely,
H. A. Burt, *Honorary Treasurer*

Hellerup, October 22nd, 1955

Gentlemen:

On behalf of the Congress Committee I most heartily thank the American Congress of Physical Medicine and Rehabilitation for the fine gesture in sending us 500 dollars for use for the coming Congress. The Congress Committee were surprised and pleased to receive the amount, and we hope we shall be able to offer our colleagues from abroad a valuable as well as entertaining congress.

Sincerely yours,
B. Strandberg, M.D. *Honorary Secretary*

Registry Contributes to World Confederation for Physical Therapy

October 11, 1955

Miss Mildred Elson, President
World Confederation for Physical Therapy
1790 Broadway
New York 19, New York

Dear Miss Elson:

At the annual meeting of the Board of the American Registry of Physical Therapists it was decided that the sum of $2,500 be contributed by the Registry to the World Confederation for Physical Therapy. Our check in this amount is directed to you as president of the organization.

The American Registry of Physical Therapists is indeed glad to be one of the subscribers to this fine group.

Very cordially yours,
AMERICAN REGISTRY OF PHYSICAL THERAPISTS
Dorothea C. Augustin
Registrar

October 17, 1955

My dear Mrs. Augustin:

Please extend to the members of the Board of the American Registry of Physical Therapists my most grateful thanks for the generous contribution of $2,500 they authorized for the World Confederation for Physical Therapy. This will indeed help us to develop our program for better physical therapy services throughout the world of which the Second Congress, which is being held June 17-23, 1956, is an important part.

Under separate cover I am sending you some Preliminary Programs which have an enrollment form attached, should you have any inquiries.

With deepest appreciation for this contribution and the interest it represents in the World Confederation, I am

Gratefully yours,
Mildred Elson, *President*

WE WANT TO KNOW ABOUT YOU —

your activities, local and national, are of interest to us. *Remember, what may not be news to you is news to others.* Please send all information before the 15th of the month. The news blank is for your convenience — **send it today!**

— MEMBERSHIP NEWS —
Archives of Physical Medicine and Rehabilitation

W h o ?
W h a t ?
W h e r e ?
W h e n ?
W h y ?

Medical News

Members are invited to send to this office items of news of general interest, for example, those relating to society activities, new hospitals, education, etc. Programs should be received at least six weeks before the date of meeting.

American College of Chest Physicians to Hold Student Essay Contest

The Council on Undergraduate Medical Education of the American College of Chest Physicians offers three cash awards for the best essay contributions by undergraduate medical students on any phase in the diagnosis and treatment of chest diseases (heart and/or lungs). First prize will be $250, second prize $100, and third prize $50. Winners will be announced at the annual meeting of the organization in Chicago, Illinois, June 7-10, 1956. Manuscripts must be submitted by April 10, 1956.

An application form, plus instructions and suggestions for manuscript preparation, can be obtained by writing the Executive Director of the American College of Chest Physicians, 112 E. Chestnut St., Chicago.

In Memoriam

It is with regret that we announce the passing of the following Congress members: J. A. C. Ethier of Sherbrooke, Quebec, Canada; George E. Crosley of Milton, Wisconsin, and Harold D. Storms, of Puerto Rico.

Canadian Association Meets

The Canadian Association of Physical Medicine and Rehabilitation will hold its fourth annual meeting on Friday and Saturday, June 1-2, 1956 in London, Ontario. The scientific session will be held on Friday and the business meeting on Saturday. The banquet is scheduled for Friday evening at the Hotel London. For complete details, write to Gustave Gingras, M.D., Secretary, 6265 Hudson Rd., Montreal, Quebec.

Congress Sectional Meeting in April

The meeting of the Eastern Section of the American Congress of Physical Medicine and Rehabilitation will be held at the Hotel Adelphia in Philadelphia on Saturday, April 7, 1956. Secretary of the Eastern Section is Harold Lefkoe, M.D., 1006 Medical Tower, 255 S. 17th St., Philadelphia.

Dr. Gordon Joins Staff at Michael Reese

Edward E. Gordon, formerly of New York City, has been appointed Director of the Department of Physical Medicine at Michael Reese Hospital Medical Center in Chicago. Dr. Gordon replaces Dr. Charles Molander, who has retired.

Pennsylvania Academy of Physical Medicine and Rehabilitation

At the January meeting of the Pennsylvania Academy of Physical Medicine and Rehabilitation, John McM Mennell presented the topic "The Use of Manipulation in Diagnosis and Therapy." A. A. Martucci of Abington, Pa., was elected President of the Academy.

Fellowships Awarded for Training Physically Handicapped

The National Society for Crippled Children and Adults, Inc., is sponsoring a Counselor Training Program designed to provide information and technics concerning the placement and vocational adjustment of severely handicapped persons. The course will be given at the Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, June 18 to July 13, 1956. Final date for filing applications is March 15, 1956. For additional information, please contact the Personnel and Training Service of the National Society for Crippled Children and Adults, Inc., 11 S. LaSalle Street, Chicago.

Registration in North Carolina

The North Carolina State Examining Committee of Physical Therapists announces that its spring examination for registration in North Carolina will be held on Friday, April 6, 1956 in Chapel Hill, N. C. Interested physical therapists should contact the secretary of the Examining Committee at least six weeks prior to examination time. Address correspondence to Secretary-Treasurer, State Examining Committee of Physical Therapists, c/o North Carolina Memorial Hospital, Chapel Hill.

Recent Publications by Members

Jerome S. Tobis, with co-author, "Role of Pediatrician and Hospital in Care of Orthopedically Handicapped Child." The Journal of the American Medical Association, December 24, 1955.

Grace M. Roth, with co-authors, "The Changes in the Intra-Arterial Pressure During Immersion of the Hand in Ice-Cold Water." Circulation, December, 1955; with co-authors, "Malignant Carcinoid with Hyperserotonemia Occurring Spontaneously or Induced by Palpation of the Tumor or by Intravenous Histamine: Report of Case." Proceedings of the Staff Meetings of the Mayo Clinic, December 14, 1955.

Abraham R. Hollender, with co-author, "Ear, Nose and Throat Problems in Older Persons." The Journal of the Florida Medical Association, January, 1956.

F. A. Hellebrandt, with co-author, "Applications of the MacQuarrie Test for Mechanical Ability." The American Journal of Occupational Therapy, Nov.-Dec. 1955.

The following papers have been published in the American Practitioner Digest of Treatment, January, 1956:

Louis B. Newman, "The Role of Physical Medicine and Rehabilitation in Chronic Medical Diseases";

J. L. Rudd, "Co-operation for Rehabilitation."

The following papers have been published in the American Journal of Physical Medicine, December, 1955:

F. A. Hellebrandt, editorial "The Future of Physical Medicine";

Morton Hoberman, with co-author, "Parallel Bar Activities in Physical Therapy and Rehabilitation";

A. F. Mastellone, with co-authors, "Electrical Stimulation in the Treatment of Muscular Trismus and Periarticular Fibrosis of the Temporomandibular Joint"; and

Igho H. Kornblueh, with co-author, "Artificial Air Ionization in Physical Medicine. Preliminary Report."

The following papers have been published in the Journal of Rehabilitation, Sept.-Oct. 1955:

Morton Hoberman, with co-authors, "Rehabilitation of the Severely Disabled"; and

Howard A. Rusk, with co-author, "Rejection of Help by Some Disabled People."

Applicants for Congress Membership

Donald Roy Adams, M.D., VA Hospital, Honor Heights Dr., Muskogee, Okla.: Sponsored by A. B. C. Knudson, M.D., Washington, D. C.

Douglas G. Carroll, M.D., Brooklandville, Md.: Sponsored by Florence Mahoney, M.D., Baltimore, Md.

Norman Borken, M.D., 1147 Ave. "B", Perry Point, Md.: Sponsored by Florence Mahoney, M.D., Baltimore.

Lucien L. Trigiano, M.D., 218 Market St., Johnstown, Pa.: Sponsored by Nicholas Mauriello, M.D., Wilkes-Barre, Pa.

Richard S. Munger, M.D., Box 184, Letterman Army Hospital, San Francisco: Sponsored by Raoul C. Psaki, M.D., San Francisco.

Emilie L. Maxwell, M.D., 120 Bulk Lane, Haverford, Pa.: Sponsored by William J. Erdman II, M.D., Philadelphia.

Personals

The following Congress members presented papers at the conference on Physical Medicine and Rehabilitation, held in December, at the VA Research Hospital in Chicago: **A. B. C. Knudson,** Washington, D. C., "Present and Future of Physical Medicine and Rehabilitation"; **Joseph M. Markel,** Detroit, "Intermediate Bed Service"; **Ben L. Boynton,** Chicago, "Ultrasound Therapy — Technic and Clinical Application"; **Milton G. Schmitt,** Chicago, "Body Mechanics — Motor Structural Balance"; **Bror S. Troedsson,** Minneapolis, "Peripheral Vascular Disorders — Evaluation and Management"; **Harry T. Zankel,** Cleveland, "Venous Circulation Studies of the Lower Extremities Using a Radioactive Tracer"; **Ray Piaskoski,** Wood, Wis., "Planning for the Patient's Discharge — The Role of Physical Medicine and Rehabilitation"; **Arthur A. Rodriquez,** Chicago, "Clinical Electrodiagnosis and Electromyography"; and **Val W. Rapp,** Tomah, Wis., "Rehabilitation in Psychiatry." **Louis B. Newman,** Chicago, was chairman of the conference and spoke on "Rehabilitation in Heart Disease." — **Herman J. Bearzy,** Dayton, Ohio, was elected to the board of directors, National Foundation for Muscular Dystrophy, Inc. — At the 36th annual meeting of the Ohio Society for Crippled Children, held in Cleveland in October, 1955, **Paul A. Nelson** participated in the panel on physical therapy as part of the "Workshop on Careers in Rehabilitation." — **Nathan Sussman,** Harrisburg, Pa., was made head of the department of Physical Medicine and Rehabilitation at Harrisburg Hospital. — The Maryland Academy of General Practice held its seventh annual meeting in Baltimore on October 26-27, 1955. **Murray B. Ferderber** of Pittsburgh presented the topic "Rehabilitation." — **Archibald P. Hudgins** of Charleston, W. Va., was awarded a fellowship in the American Medical Writers' Association in September of last year. — The Mississippi Valley Medical Society awarded **Arthur W. Fleming,** Chicago, a fellowship "in recognition of high qualifications, personal

and professional, and of established professional standing." — **Vann S. Taylor** of Dallas has accepted a position as assistant professor and chairman of the Department of Physical Medicine and Rehabilitation, Southwestern Medical School, University of Texas and Chief of the Department of Physical Medicine and Rehabilitation, Parkland Memorial Hospital. — The American Academy of Cerebral Palsy recently elected to fellowship **S. Malvern Dorinson** of San Francisco. Dr. Dorinson gave a demonstration on the "Management of the Stroke Patient" to an Institute for Nursing Home Operators. — At the invitation of the Psychiatric Institute, **Irvin Neufeld** of New York City delivered a lecture on "Meaning of Psychosomatic Symptoms" at the meeting in November, 1955. — **Herbert Kent**, Oklahoma City, has been appointed Associate Professor in the Department of Physical Medicine, University of Oklahoma School of Medicine. — The Cleveland Welfare Federation, Speakers' Division, recently awarded a certificate of appreciation to **Harry T. Zankel** of Cleveland for his assistance in the recent Community Chest Drive. — In June, 1955, the University of Kansas Medical Center, School of Physical Therapy, appointed as instructor in Physical Medicine, **Stanley F. Radzyminski** of Wadsworth, Kans. — **Leonard D. Policoff**, Albany, N. Y., was made Director of the Department of Physical Medicine and Rehabilitation at Albany Hospital; he is Associate Professor in Physical Medicine and Rehabilitation of Albany Medical College. — In September, 1955, **Samuel G. Feuer** of Brooklyn was promoted to Clinical Assistant Professor of Medicine, State University of New York College of Medicine, New York City. Dr. Feuer delivered an address on "Rehabilitation Problems of Geriatric Patient" before 3-5 Hospital Company, U.S.N.R. in October, 1955. — The Gonzales Warm Springs Foundation at Texas for Crippled Children in November of last year appointed **Emma Varnerin** as Assistant Physiatrist to the Medical Director, **Odon von Werssowetz.** — **Donald L. Rose**, Kansas City, Kans., has been appointed rehabilitation consultant to the State Hospital Advisory Council.

Books Received

Books received are acknowledged in this column as full return for the courtesy of the senders. Reviews will be published in future issues of the journal. Books listed are not available for lending.

Rheumatoid Arthritis and Psoriasis Vulgaris by Tibor Benedek; **Anxiety and Stress; An Interdisciplinary Study of a Life Situation** by Harold Basowitz, et al; **The Pediatric Years: A Guide in Pediatrics for Workers in Health, Education and Welfare** by Louis Spekter; **Modern Actinotherapy: A Review of the Literature, Giving an Outline of Indications and Technique** by Raymond H. Beckett; **Endogenous Endocrinotherapy (Samuels Therapy) Including the Causal Treatment of Cancer** by Jules Samuels; **Health, Culture and Community: Case Studies of Public Reactions to Health Programs** by Benjamin D. Paul; **The Pathogenesis of Poliomyelitis** by Harold K. Faber; **Aspects of Synthesis and Order in Growth** edited by Dorothea Rudnick; **Essentials of Chemistry** by Gretchen O. Luros; **A Short History of Medicine** by Erwin H. Ackernecht; **Advances in Cancer Research** edited by Jesse P. Greenstein and Alexander Haddow; **Biochemical Preparations** edited by W. W. Westerfeld; **A Handbook of Hospital Psychiatry** by Louis Linn; **Understanding People in Distress** by Barney Katz and Louis P. Thorpe; **A Primer of Electrocardiography** by George E. Burch and Travis Winsor; **Orthopadische Krankengymnastik: Lexikon und Kompendium** by Martha Scharll; **Nursing Practice and the Law** by Milton J. Lesnik and Bernice E. Anderson; **The American Academy of Orthopaedic Surgeons Instruction Course Lectures, Volume XII** edited by R. Beverly Raney; **An Elementary Textbook of Psychoanalysis** by Charles Brenner; **An Inventory of Social and Economic Research in Health** compiled by Frederick R. Strunk; **Preventive Medicine in World War II, Volume II: Environmental Hygiene** edited by John Boyd Coates, Jr.; **The Shoulder and Environs** by James E. Bateman; **Treatment in Psychiatry** by Oskar Diethelm; **Mental Hygiene in Public Health** by Paul V. Lemkau; **The Importance of Physiotherapy in the Treatment of Sick Children** by J. M. Jewry-Harbert; **The Back and Its Disk Syndromes** by Philip Lewin; **Psychiatry for the Family Physician** by C. Knight Aldrich; **Migraine and Periodic Headache: A Modern Approach to Successful Treatment** by Nevil Leyton; **Gold Treatment in Rheumatoid Arthritis: With Some Notes on Hormone-Gold and Hormone-Salazopyrin Therapy** by Folke Bohman; **The Story of Medicine** by Kenneth Walker; **Talking with Patients** by Brian Bird; **Vitamins and Hormones: Advances in Research and Applications, Volume XIII** edited by Robert S. Harris, et al; **Research and Education in Rheumatic Diseases: Transactions of First National Conference at National Institutes of Health, Nov. 19, 1953** edited by Josephine J. Bunim; **Diseases of the Skin** by Oliver S. Ormsby and Hamilton Montgomery.

Newly Registered Therapists
November 30, 1955

Baldasare, Joan N., 615 Belmont Ave., Newark, N. J.

Blake, Nancy A., Harry-Anna Crippled Children's Home, Umatilla, Fla.

Childs, Patricia Ann, Box 606, Center, Tex.
Gilbert, J. T., Rt. 2, Florence, Miss.
Gunsberg, Amos M., 61 W. 74 St., New York
Hildreth, Patricia Ann, 4217A Sixth Ave., N. E., Seattle
Lee, Luna V., 45 Morningside Dr., E., Bristol, Conn.
Lurton, Virginia G., 3850 Creswell Ave., Shreveport, La.
Menchel, Jerome, 2117 E. 26 St., Brooklyn, N. Y.
Moss, Marvin F., 1475 Wythe Pl., Bronx, N. Y.
Nasir, Diana T., Beir-Zett College, Beir-Zett, Trans-Jordan, Israel
Nutt, Rex L., 3428 Purdue, Dallas, Texas
Ruslander, Jane L., 105 Chatham Ave., Buffalo
Sessions, Donovan O., Rt. 5, Union, Miss.
Smith, Joan C., 705 W. 35th Pl., Los Angeles
Spielholz, Neil I., 1024 Montgomery St., Brooklyn
Spohrer, Francis R., 62 Glen Ridge Ave., Glen Ridge, N. J.
Stallings, Charlotte J., Box 377, Raymondville, Tex.
Stewart, Donald L., 640 Grape St., Abilene, Tex.
Stotz, Karen, 126 W. Prospect Ave., Pittsburgh
Sullivan, Janet Ann, 765 Hempstead Ave., West Hempstead, N. Y.
Torres, Mary Lou, 369 Frederick St., San Francisco
Van Wormer, Katherine B., Slingerlands R. D., N. Y.

December 2, 1955

Anderson, Barbara L., 5154 Alamaden Dr., Los Angeles
Anderson, Lorna C., 7437 Henefer St., Los Angeles
Andros, Alexander, Jr., 1739 California St., Burbank, Calif.
Baumer, Eileen C., 221 W. Ellis Ave., Inglewood, Calif.
Bond, Phyllis L., 2343 17th St., Cuyahoga Falls, Ohio
Canton, Philip A., 98 N. Beeson Ave., Uniontown, Pa.
Copp, Nancy Ray, 1101 Bank St., Bridgeville, Pa.
Dobbins, Carolyn, 314 Elm St., Moorestown, N. J.
Florian, Mary Grace, 900 Watson St., Pittsburgh
Grayson, John L. Lewis, Box 150, VA Hospital, Tuskegee, Ala.
Hayhurst, Charles W., Stoney Rd., Fairmont, W. Va.
James, E. Jane Child, 3700 Noyes Ave., Charleston, W. Va.
Janssen, Maria W., 2057 Beechwood Blvd., Pittsburgh
Kauffman, Joann Rupert, Satillo, Pa.
Kirkland, Merrill E., 981 S. Westmoreland, Los Angeles
Lopez, Lucila Diaz, 510 Espana St., Hato Rey, P. R.
Lurty, William J., McCreary Rd., Erie, Pa.
Maloney, Frances E., 3229 Elliott St., San Diego, Calif.
Massey, Lenita C., 2004 Walker, Memphis, Tenn.
McDonald, Dorothy E., 529 California Ave., Pittsburgh
Miyahata, Yae, 1677 S. Harvard Blvd., Los Angeles
Osborne, Eleanor G., RD 2, New Wilmington, Pa.
Perry, Donald L., 11930 Louise Ave., Los Angeles
Runser, Marjorie F., 3940 Los Arabis Dr., Lafayette, Calif.
Schmitt, Grace A., 224 First St., Sharon, Pa.
Smith, Burton H., 5009 Farquhar St., Los Angeles
Steinmetz, Robert N., 325 Shawnee Dr., Erie, Pa.
Strosser, Eugene L., 629 E. Beaver St., Mercer, Pa.
Tronson, Charles E., 8536 Keokuk Ave., Canoga Park, Calif.
Urrutia, Teresa A., 252 Ribot St., Stop 18, Santurce, P. R.
Wietnik, Edwin S., 714 S. Jefferson, Hastings, Mich.
Yaki, Betty H., 15302 Sylvanwood Ave., Norwalk, Calif.
Zuckerman, Marilyn F., 3915 Marathon St., Los Angeles

December 8, 1955

Cox, Martha P., Rt. 3, Box 222, Jackson, Miss.
Farmer, Betty E., Cedar Hill, Tenn.
Jordan, Winston E., 4104 Youree Dr., Shreveport, La.
Lewis, Raymond F., 4613 Saratoga, New Orleans
Long, Mary Margaret, Ferriday, La.
McIntosh, Margaret Ann, 115½ Westminster Dr., Jacksonville, N. C.
Milner, Alfred W., Jr., 8215 Carlton St., Norfolk, Va.
Robbert, Jacquelyn Ann, 1445 Henry Clay Ave., New Orleans
Short, Frances P., 207 S. Madison St., Kosciusko, Miss.
Unkeless, Helga, 1375 S. Sierra Bonita, Los Angeles
Wagner, Robert J., c/o Mrs. A. C. Droppers, Oostburg, Wis.

December 14, 1955

Vivian Price, 310 S. Clark Ave., Magnolia, Miss.

December 19, 1955

William V. Alexson, c/o Dr. C. G. Alexson, Strong Memorial Hospital, Rochester, N. Y.
Arnold O. Allenius, 825 Walton Ave., Bronx, N. Y.
Gloria E. Applebaum, 8730 W. Kingsbury, St. Louis, Mo.
Gail J. Chirnoff, 833 Potomac Ave., Buffalo
Benedict R. Kraus, 600 Ellicott Creek, Rd., Tonawanda, N. Y.
Gerald T. Maroney, 113 Hubbell Ave., Buffalo
Michael J. Matlock, 420 Shirley Ave., Buffalo
Patricia J. Peugeot, 7 Winston Rd., Buffalo
Barbara W. Simpson, 382 Hartford Ave., Kenmore, N. Y.
Gerald Stern, 100 Winthrop St., Brooklyn
Barbara Ann Stevenson, 105 E. Amherst St., Buffalo
Louis M. Tinghino, 25 W. Oldis St., Rochelle Park, N. J.

Physical Medicine Abstracts

Heparin and Corticotropin (ACTH): Analogies and Differences. F. De Matteis. Minerva med. (In Italian) **46**:1800 (June 20) 1955.

Heparin and corticotropin both stimulate the adrenals and thyroid and cause involution of the thymus, which is most evident after a short period of treatment. They induce severe endocrine changes after prolonged administration. They both produce a hypocholesterinemic effect, especially on esterified cholesterol, and also produce an action that modifies paper electrophoresis with a decrease of the albumins and a large increase of the globulins. Other corticotropin-like properties of heparin are an "anti-sludging" action; an "antianaphylactic" action, which is more evident than that of corticotropin; an "antihyaluronidase" and "antiexudative" effect on the diffusion process; a constant effect on peripheral eosinopenia, and ar antirheumatic effect on acute rheumatic disease in children. Prolonged administration of either of the two drugs produces weight loss accompanied by partial atrophy of the skin, and, in animals, loss of hair. Other endocrine changes that result include a weight loss in the testicles and spleen, hyperemia and edema of the hypophysis, and a weight increase in the liver, the kidney, and to a lesser extent, the thyroid. However, the effects of these two agents on blood coagulation differ. Heparin extends the process whereas corticotropin shortens it. The anticoagulant effect of heparin can be increased, however, by the concomitant administration of corticotropin. To obtain these effects large doses of heparin are necessary and pure preparation of corticotropin must be used.

The Management of the Poliomyelitis Problem. H. E. Van Riper. Am. J. Occup. Therapy **9**:255 (Sept.-Oct.) 1955.

Occupational therapists may expect to continue to play a large role in the rehabilitation of poliomyelitis patients for many years to come since about 70,000 persons are presently suffering from the effects of paralytic poliomyelitis. Then, too, the number of poliomyelitis cases per year has been increasing throughout the world. Although the Salk vaccine seems to hold some promise, it is not yet known whether it is effective against paralytic poliomyelitis under natural conditions of exposure. Even if the vaccine proves effective, new cases of poliomyelitis will still develop since it would require considerable time to accomplish universal vaccination. The four crucial steps that led to the Salk vaccine were (1) demonstration that there are only three types of poliomyelitis virus, (2) discovery that the virus could be grown in vitro on non-nervous tissue, (3) the field trials with gamma globulin, the blood derivative that contains polio antibodies, and the demonstration that the poliomyelitis virus appears in the blood stream for a short time in the course of the disease, and (4) the documentation of the fact that an inactivated virus vaccine would raise antibody levels against poliomyelitis infection.

The Painful Heel. G. K. Rose. Brit. M. J. **2**:831 (Oct. 1) 1955.

Results with orthodox treatment of pain in the region of the postero-medial attachment of the plantar fascia to the os calcis (painful heel) are often disappointing. In general, it is agreed that this condition is one of chronic strain of the posterior end of the central part of the plantar fascia, sometimes initiated or aggravated by toxic conditions and occasionally accompanied by a calcaneal spur. The spur is probably the manifestation of past or present chronic strain in this area. As the strain is longitudinal, some method other than the conventional heel pads is required. The portion of the plantar fascia causing pain is probably that attached just medial to the vertical axis of the peritalar joint; thus, strain should be relieved by an insole that tilts the heel and relaxes this part of the fascia. In 17 patients with painful heel good results have been achieved with such an insole. Pain was relieved in all patients, and all but three patients have not required another insole after the first wore out. These three patients had the condition for a considerable time before treatment and are heavy walkers.

The Latissimus Dorsi Syndrome. R. J. Dittrich. Ohio State M. J. **51**:973 (Oct.) 1955.

The "latissimus dorsi syndrome" is characterized by pain in the upper part of the body.

The mechanism is one of referred pain and tenderness arising from a primary source and spreading to other somatic structures that are innervated by the same spinal segmental nerves as those in which the stimuli originate. These stimuli result from irritation of parts of the aponeurosis of the latissimus dorsi muscle in the midlumbar region over the lateral segment of the sacrospinalis muscle. This region is susceptible to trauma because of the manner in which a portion of this muscle is attached to the lumbodorsal fascia. Injection of a local anesthetic at the site of pain has verified the suspected mechanism of transmission of impulses. Referred pain and tenderness arising from the latissimus dorsi muscle would be found in areas receiving their nerve supply from the same nerves as this muscle — the sixth, seventh, and eighth cervical nerves. This condition can be corrected by resection of a narrow strip of the aponeurosis of the latissimus dorsi muscle in the lumbar region above the site of primary pain or tenderness.

Results of French Experiments with Prednisone (Metacortandracin) in Inflammatory Rheumatism. F. Coste; F. Delbarre; P. Massias, and others. Rev. du rhum. (In French) **22**:385 (May) 1955.

French experiments with metacortandracin (prednisone) in inflammatory rheumatism were carried out in 75 patients who received treatment for 15 to 60 days. Both clinical and biological results were very satisfactory in most cases. In patients who had previously received corticotherapy, metacortandracin proved at least twice as active as oral hydrocortisone and three times as active as cortisone. Tolerance was good in general, but some authors reported such side-effects as rounding of the face, nervous disturbances, digestive disorders, and nocturnal cramps. These were observed especially with high doses (35 to 40 mg.). Therefore, it appears that the same precautions as taken with similar hormones will be necessary for metacortandracin.

Incidence of Amebiasis in Healthy Individuals, Clinic Patients and Those with Rheumatoid Arthritis. R. E. Rinehart, and H. Marcus. Northwest Med. **54**:708 (July) 1955.

Because of the high incidence of amebic infections in patients with rheumatoid arthritis and the uncertainty of its diagnosis, prevalence, and role in the causation of disease, exhaustive studies are needed. Areas of investigation covered in this report are selection of an accurate, simple, and rapid diagnostic test suitable for survey studies, and determination of the incidence of infection in healthy individuals and in those with and without rheumatoid arthritis.

It was found that examination of a wet preparation stained with iodine, preferably after concentration, is the most sensitive method for detection of the cystic forms of *E. histolytica*. If done properly, this method does not give rise to false positive reports. Six stool examinations, at intervals of two or more days, will diagnose 95 per cent or more of infected cases. Single examination will reveal 40 to 60 per cent of those infected.

About 30 per cent of normal persons living in Oregon are subclinically infected with *E. histolytica* at any given time. A similar incidence is found in persons with a wide variety of illnesses. Ninety-five per cent of patients with rheumatoid arthritis are infected with *E. histolytica*.

Safe Management of Modified Electrotherapy. J. R. Lincoln, and F. S. Broggi. New England J. Med. **253**:546 (Sept. 29) 1955.

A modified method of electrotherapy was used in both good-risk and poor-risk patients in over 3200 treatments. The method involves the routine use of thiopental sodium to produce light sleep, succinlycholine as a muscle relaxant, and oxygen to prevent hypoxia. The importance of the routine use of oxygen before and after treatment in all patients is stressed. An anesthetist is included as an integral part of the electrotherapy team to administer the muscle relaxant and oxygen, to provide resuscitative measures if necessary, and to manage any post-treatment excitement state that may occur. By the use of this modified method of electrotherapy, skeletal injuries have been eliminated, but frequency of remissions were the same as with the standard method. The only major complication encountered was a case of premature labor and delivery of a macerated fetus, but there was presumptive evidence to indicate that this was merely a coincidental occurrence.

Treatment of Children in the Iron Lung. K. Stenger. Klin. Wchnschr. (In German) **33**:654 (July 15) 1955.

Bulbar forms of poliomyelitis are characterized by disturbances in swallowing that permit viscid sputum to collect in the posterior portion of the pharynx, which obstructs the upper airways. Examination will reveal that this type of obstruction is not centrally produced. Severe arrhythmia is caused by respiratory disturbances involving the substantia reticularis and the respiratory centers in the medulla, pons, and hypothala-

mus. Although cyanosis may be present, breathing may be superficial. Spinal paralysis results in erratic muscular symptoms. Impaired exchange of gases and inadequate pulmonary ventilation, resulting in atelectasis which adversely effects circulation, may prove fatal. The hypoxemia and cyanosis caused by oxygen deficiency ultimately produce unconsciousness. Elimination of carbon dioxide is also impaired by deficient respiratory musculature. Tests that have proved useful in determining the condition of the patient in the iron lung include measurement of carbon dioxide content in alveolar air and the blood, electrocardiography, blood pressure determinations, and measurement of oxygen saturation in tissues. Level of negative and positive pressures and frequencies in the iron lung must be determined for each individual and for each type of apparatus. If the muscles of deglutition are paralyzed, tracheotomy is recommended as positive pressure breathing through the trachea is as effective as treatment in the iron lung; but in spinal respiratory paralysis, the iron lung is preferred. Megaphen, a phenothiazine derivative, is administered to patients to help them adjust to the rhythm of the iron lung. Strophanthin is given to prevent cardiac failure and nikethamide to combat circulatory collapse of central origin.

Spondylolisthesis: A Critical Review of a Consecutive Series of Cases Treated by Arthrodesis. D. M. Bosworth; J. W. Fielding; L. Demarest, and M. Bonaquist. J. Bone & Joint Surg. **37A**:767 (July) 1955.

One hundred fifteen patients were treated by spine fusion for spondylolisthesis in the lumbar spine, but results are based on 75 patients operated on by a single technic. Since 1944 the technic has consisted of implantation of an autogenous, cortical iliac graft of the distraction type, supplemented by strips of cancellous iliac bone placed beneath it. Since 1941 the fifth lumbar laminar arch has generally been removed. Since 1942 bone grafts have been placed in contact with the previously denuded stumps of the pedicles of the displaced segment. The arch was removed in 64 patients. The deep layers of all wounds were closed with chromic catgut sutures, the superficial layers with silk sutures. The average hospital stay was 24.6 days; ambulation was permitted on the seventeenth postoperative day. A lumbosacral belt was generally worn (average time, 9 months) when the patient was no longer restricted to his bed. Prior to surgery, most of the patients had had intensive treatment for a long time, consisting of rest, decrease in activity, wearing of supporting devices, or manipulation of the spine. In 73 patients who could be evaluated, 89 per cent were asymptomatic after the operation. Of the 66 with solid fusion, 94 per cent were asymptomatic; of the seven patients in whom fusion failed, 43 per cent were asymptomatic. No deaths resulted from the operation.

In these patients, the forward slip of the vertebral body and the defect in the pars interarticularis represent only a part of the anatomical alteration. The arch of the displaced segment tends to support the spine and prevent further slippage; thus, removal of the arch is advisable only if it is replaced by a bone graft to supply similar support. Once solid fusion has been obtained, support of the weakened area is permanent. The authors believe that pain in spondylolisthesis results from impingement of malaligned bony elements and from abnormal stress on fibrous or ligamentous structures. Extradural pressure from prolapse of an intervertebral disc occurs occasionally. Disc degeneration in itself cannot cause pain.

Treatment of Asthma by Corticotherapy: Based on Ninety-Five Cases. P. Vallery-Radot; C. Laroche, and G. Lyon. Presse med. (In French) **63**:1043 (July 16) 1955.

Corticotropin, cortisone, and hydrocortisone were used to treat 95 patients with severe asthma. The effects of each hormone were quite similar. Symptoms of asthma diminished rapidly in 80 of the patients. Treatment failed or was not satisfactory in 15 patients, 4 of whom died. The lesions usually seen in status asthmaticus were revealed by necroscopic examination. Long-term results varied; only 10 patients benefited from corticotherapy for more than 6 months. Sixteen patients were treated for from 3 to 36 months; good results were achieved in 12 of these patients and fair results in one. The daily dosage of corticotropin or cortisone used was 50 to 100 mg. Since results of therapy do not seem to depend on age, severity, or duration of disease, and whether the asthma is caused by an allergy or a bronchial superinfection, it is not possible to foretell whether treatment will be successful in a particular patient.

Chloroquine Therapy in Rheumatoid Arthritis. R. E. Rinehart. Northwest Med. **54**:713 (July) 1955.

The high incidence of amebiasis in patients with rheumatoid arthritis suggests that a relationship may exist between these two conditions. A systematic investigation of various drugs and treatment programs for amebiasis was undertaken. The standard treatment for amebic dysentery used by the U. S. Army Medical Department, 0.25 gm. of carbarsone twice daily for 10 days followed by 0.65 gm. of diodoquin three times a day for 10 days proved of little benefit. Many other amebicidal agents were tried. Toxicity and unpleasant side-effects were encountered and only irregular improvement of the rheumatoid

state occurred. Diodoquin and chloroquine best fulfilled the requirements for nontoxicity, toleration, inexpensiveness, and effectiveness against both intra- and extra-intestinal parasitic forms. The dose used was 0.65 gm. of diodoquin three times a day and 0.25 gm. of chloroquine twice a day for 3 to 12 weeks. Best results were noted in children and young adults. Eight of 11 of this group demonstrated major improvement, a few could be considered as in complete remission; the three failures did not show any improvement. None are considered completely cured. Of 14 adults treated, 3 showed complete remission, 1 major improvement, 4 minor improvement, and 6 no improvement. Although the possibility that amebicidal drugs exert a specific antimetabolic action leading to improvement of the rheumatoid state must be considered, much more experience and many more studies are required to determine the exact relationship between amebiasis and rheumatoid arthritis.

Some Observations on the After-care of the Arthritic Patient. J. Bastow. Journal of the Chartered Society of Physiotherapy **41**:273 (Sept.) 1955.

As most forms of arthritis are chronic, management of arthritic patients at home or at work determines whether the patient will be a burden on the community. Faulty body mechanics is the greatest single factor in producing osteoarthritis; thus, an important function of the physical therapist is to educate the potential osteoarthritic patient in the elements of good posture. Joints develop signs of arthritis by uneven strains and stresses. They are kept healthy if they are part of a healthy organism, used regularly and fully, but not overused, and rested if temporarily injured. An arthritic patient with a stiff joint can be relieved by increasing the range of motion in adjacent joints. Sensible diet and bowel management also contribute to the welfare of such patients. The physical therapist should have a good understanding of the general principles of after-care of arthroplasty of the hip, one of the most frequently employed operations in arthritic patients. He should keep himself informed of such gadgets as long-handled shoe-horns and extendible forceps designed to aid arthritic patients in self-care. Management of an acute phase of rheumatoid arthritis and a period of remission are also important. In the former, rest is the keynote of success; in the latter, support. Infective arthritis is often controlled by antibiotics, but it must be remembered that tissue repair lags far behind symptomatic relief. Edema should never be allowed to persist. Gout is best prevented by knowing, then avoiding, the factors that precipitate an attack. Views on the treatment of spondylitus ankylosis after irradiation diverge widely. During sleep and anesthesia spinal joints should be supported to prevent strain. These random observations are meant to emphasize that only by constant vigilance can the physical therapist fulfill his role in after-care of arthritic patients.

Industrial Accident Cases and the Community Rehabilitation Center, W. S. Allan. Am. J. Occup. Therapy **9**:252 (Sept.-Oct.) 1955.

The rehabilitation of the injured industrial worker presents a tremendous challenge. There can be no simple solution to the problem. It requires the active cooperation of many organizations and individuals. Restoration of the injured employee to a useful and productive life is a goal which is both economically and socially sound. Ten points that could serve as guideposts for any local community rehabilitation facility to handle effectively case referrals from insurance companies and industry are as follows:

1. Adequate medical supervision and periodic evaluation, especially of prescription for therapy.
2. Adequate occupational therapy.
3. Specialized, short-term program for nonchronic cases.
4. Orientation of the staff to the specific needs of the industrial case-individualized program.
5. Integration and coordination of community center facilities with vocational training and employment agencies or institutions.
6. Enlistment of the aid of industrial groups who can recommend and provide job opportunities.
7. Continuous counseling from accident to re-employment.
8. Enlistment of the aid of industrial physicians, medical directors of corporations, and local insurance personnel.
9. Proper attention to common industrial injuries, such as fractures and tendon, nerve, and back injuries.
10. Planned prosthetic program, preferably with staff or consultant certified prosthetist.

The Physiology of Channel Swimmers. L. G. C. Pugh, and O. G. Edholm. Lancet **269(6893)**:761 (Oct. 8) 1955.

This paper presents the results of three years' study of the factors concerned in the ability to endure immersion in cold water. To find these factors the authors studied long-distance swimmers and normal non-swimmers. Channel swimmers may develop hypothermia without ill effects, but it seems unlikely that this is an important part of the ability to withstand cold. From experiments on normal subjects there is a sudden drop in rectal temperature indicative of inability to

maintain stable bodily temperature. It is this which produces a muscular weakness and an intolerance of cold water. The rate of heat production in long-distance swimmers is no higher than in normal persons. It is the total amount of energy expended rather than the rate that it is expended which distinguishes the athlete from the untrained normal subject. Being still in cold water does not decrease bodily temperatures as rapidly as does swimming. Therefore, the traditional advice given by the navy, to cling to wreckage and not to waste energy by swimming is probably correct.

The most important and clearest finding in this study was that long-distance swimmers can maintain a given bodily temperature for a long time because of their physique. They have a thick layer of subcutaneous fat which insulates the body and decreases the rate of loss of heat.

Factors Affecting the Endurance of Psychomotor Skills. Robert B. Payne, and George F. Hauty. J. Aviation Med. **26**:382 (Oct.) 1955.

The authors report investigations into the problems of fatigue in which they studied the depreciative effects of a task activity upon the subsequent inclination and/or ability to perform that activity. The principal criterion of such effects was proficiency decrement in the task under study.

Methods for the study of work decrement relevant to aircraft pilotry were standardized. The devices used were the U.S.A.F. SAM Multi-dimensional Pursuit Test and the U.S.A.F. SAM Airplane Control Test. The operation of these devices involved complex psychomotor skill and nearly all subjects exhibited significant decrement during the first two hours of a four-hour work period.

In investigating counteraction of work decrement, the authors undertook various studies of a single and joint efficacy of pharmacological stimulants, motivational technics, and task design factors. Several types of motivational technics, as well as improvement in task design in the form of "information feedback," resulted in improved task attitudes or performance levels but did not postpone proficiency decline. Cerebral stimulants provided remarkable arrest of work decrement, a 5 mg. dose of Dexedrine delivered prior to work being the most effective.

Dexedrine appears to have significant restorative, as well as preservative, properties, even after work decrement is well established. The authors believe none of these effects can be ascribed to concomitant euphoric changes in task attitudes.

There were significant individual differences in latency, rate, and extent of work decrement in the various subjects. These differences provide a means of studying the role of predisposition in work decrement, and possibly its predictability.

Management of Lesions of the Feet in Diabetes. David Hurwitz. Diabetes **4**:107, 1955.

Lesions of the feet account for two-thirds of the diabetic in-patient admissions at the Boston City Hospital. Conservative management through antibiotic therapy and surgical drainage of the infected areas will usually avoid the necessity of a high amputation. Such management requires prolonged periods of hospitalization, often three months or more.

The treatment of patients with foot infections is as follows:

1. All patients with any foot infections are hospitalized.
2. An adequate high-protein diet is provided.
3. Diabetes is brought under good control.
4. Cultures and sensitivity studies are obtained from the infected areas and appropriate antibiotics administered. If no open lesion is present, penicillin in doses of 600,000 to 1,000,000 units daily is given.
5. Wide surgical drainage of the infected area is provided within twenty-four hours of admission and repeated as needed thereafter.

After initial drainage, the foot should be dressed daily. Occasionally digits or metatarsals must be sacrificed because of osteomyelitis or in order to provide adequate drainage. Healing is usually rapid after the infection has become quiescent. Treatment of gangrene may require a transmetatarsal or high amputation. The contribution of lumbar sympathectomy is doubtful and difficult to evaluate, and is not recommended routinely in foot lesions associated with diabetic arteriosclerotic disease.

This report contains no information relative to follow-up of these patients. Everyone will agree that infections of the feet in diabetic patients can be brought under control and the lesions ultimately healed with the aid of antibiotics, surgical drainage and time. However, these patients commonly return a few weeks or months after discharge with recurrence of infected foot lesions necessitating repetitions of prolonged periods of hospitalization. Althought these tissues with severely restricted blood supply will heal under such management, the circulation is inadequate to maintain the local metabolic demands of activity and the tissues soon break down again under the stress of weight bearing.

More important than "walking out on his own two feet" is the total morbidity of the patient. If follow-up studies reveal that the majority of these patients require frequent repetition of prolonged hospitalization and ultimate amputation, it would appear that the "conservative" treatment of such problems would be early amputation at the optimal site for fitting of a comfortable and useful prosthesis. The patient is a much better

candidate for rehabilitation before he becomes generally debilitated as a result of repeated prolonged hospitalizations.

Modern Concepts in the Treatment of Burns. Curtis P. Artz, and Harry S. Soroff. J.A.M.A. 159:411, 1955.

The significant advances during the past ten years in the treatment of burns are based on a more thorough understanding of the physiological derangements that occur after burning. The burned patient is appraised principally on the basis of the extent and depth of the injury sustained. The "rule of nines" is useful in expressing the extent of injury and a "burn index" is suggested as a practical guide for the severity of injury. In patients with moderate or critical burns general supportive care should take precedence over treatment of the local burn wound. Immediate hospital treatment includes intravenous morphine, analgesia, immediate and rapid infusion of a sufficient amount of a plasma volume expander, a tracheotomy if respiratory damage is suspected, tetanus prophylaxis and antibiotic therapy. Maintenance of fluid, electrolytes, and nutrition is a most important part of treatment. In the local care of the burn wound every effort should be made to prevent and control infection and to close the contaminated wound as soon as possible. Aseptic technic, including masks, should be enforced. Advantages and disadvantages of exposure or occlusive dressings are discussed. The use of homografts has been found useful in providing temporary closure of large burned areas. The occurrence of septicemia and duodenal ulcer constitutes outstanding problems in the management of burns and the aims in treatment of these problems are discussed.

The fairly early and intensive use of detergent whirlpool is invaluable in the removal of dried exudate, debris and products of infection from the burned and grafted areas. Daily irradiation with ultraviolet light to these areas, as well as the donor sites, aids in preventing infection and provides a stimulus to mercurochrome solution. Passive motion and active resistive exercise, early and persistently applied, assist immeasurably in reduction of edema, increasing circulation, promoting healing, reducing residual restriction of joint motion and regaining normal strength in the burned member. Occupational therapy provides many technics for recovering functional dexterity and developing skills in activities of daily living. A discussion of the treatment of burns which does not include these procedures for the rehabilitation of the patient is incomplete.

Capillary Vascularization in Puppies Born at a Simulated Altitude of 20,000 Feet. E. L. Becker; R. G. Cooper, and G. D. Hathaway. J. Appl. Physiol. 8:166 (Sept.) 1955.

It is well known that in the process of altitude acclimatization, changes take place in the vascularization of tissues. The authors set out to determine whether or not these changes took place in utero.

A mongrel dog was kept in a pressure chamber at a simulated altitude of 20,000 feet for a period of two years. The dog was maintained at this altitude continuously except for one hour each day to allow for cleaning of the chamber and feeding. The male dog was also maintained at the same altitude for approximately the same period of time.

Hemoglobin studies on the newborn puppies showed an average of 20.5 gm. per cent in contrast to 12.3 gm. per cent hemoglobin in a group of control puppies.

Hemotoxylin and eosin stains of the liver and kidneys of the acclimatized puppies showed marked capillary engorgement. The liver was so markedly involved that it was impossible to differentiate the normal architecture of the liver lobules.

Capillary stains showed that the ratio of capillaries to parenchymal tissue was consistently higher in the acclimatized group than in the control group.

The present work would indicate that the process of acclimatization does take place in utero primarily through an increase both in the total number of capillaries present as well as increased diameter of the capillaries.

The Chandler Table: Analysis of its Rationale in the Mobilization of the Shoulder Joint. F. A. Hellebrandt; S. J. Houtz; M. J. Partridge, and C. E. Walters. Phys. Therapy Rev. 35:545 (Oct.) 1955.

In 1930, Dr. F. A. Chandler designed a special table to expedite the mobilization of the shoulder joint. The beliefs which motivated this development were first, that relaxation of the shoulder girdle musculature is better in recumbency than in the classical Codman position; second, that motion may be augmented by loading the moving part at its distal end; third, the momentum imparted by the load serves a useful purpose only if applied without grasping.

Two series of experiments were performed, each in one normal adult. Electromyographic tracings, using skin electrodes, were taken while the shoulder was carried through various motions both with and without weights. The arm was suspended in the classical Codman position, the modified Sperry position and the Chandler position.

The authors showed that the Chandler position was superior to the Codman position because of less neuromuscular activity being present while the patient was in the Chandler position. The Sperry position tended to increase the tonic activity of the whole shoulder girdle and therefore inhibited mobilization.

They showed that carrying a load in the affected arm imparts momentum to the mov-

ing appendage and reduces the electrical activity once the part has been set in motion. However, if the load is grasped in the hand, the tension of the shoulder musculature is reflexly increased and therefore restricts mobilization.

The results achieved by this work are revealing indeed and will alter considerably the method of treatment utilized to mobilize the shoulder joint.

Fractures of the Pelvis: A Report of Eighty Cases Treated at University Hospitals. Leonard F. Peltier. Minnesota Med. **38**:563 (Aug.) 1955.

This report is based on patients treated at University Hospitals in the years 1947 through 1954. The age range was from three to 93 years. One-third of this group had isolated fractures of the pelvic ring. Two-thirds of them had multiple injuries in addition to pelvic fractures. Sixteen had visceral injuries.

There were eight deaths occurring in this group, a mortality of 10 per cent. One occurred in a patient with renal failure associated with congenital polycystic kidneys. One patient died of cardiac arrest during anesthesia for suprapubic cystostomy in treatment of a ruptured bladder. Four patients died from complications of injuries to abdominal organs. One patient died of undetermined causes after leaving the hospital. One died of amyloidosis three years after injury as a result of chronic pelvic suppuration following an open fracture of the pubic rami and a ruptured bladder.

There were only three complications directly attributable to the pelvic fractures. These were an ischio-rectal abscess, a urethral stricture, and amyloidosis. There were no complications of fracture healing. Bony union of the pelvic fractures and stabilization of the symphysis separations occurred in all cases.

Three-fourths of this group sustained isolated fractures of the ilium, or unilateral or bilateral fractures of the pubic rami. These patients required only good supportive care and the institution of activity as soon as they were able to move about. Plaster dressings were not used in any of these patients.

One-fourth of this group required specific treatment for their pelvic fractures. These included fractures with displacement of the hemi-pelvis, fractures of the acetabulum, and symphyseal separation. Acetabular fractures were always associated with dislocation of the hip, nearly always posterior, and the results in these cases depended upon the degree of damage to the femoral head with the possibility of aseptic necrosis.

Artificial Respiration. James L. Whittenberger. Physiol. Rev. **35**:611 (July) 1955.

The author reviews briefly the physiologic aspects of acute respiratory insufficiency and discusses respiratory mechanics preliminary to a description of the various methods of artifical respiration, the advantages and disadvantages of each, together with their effects and hazards.

Artificial and natural respiration are similar in basic mechanical relationships of volume change, flow rates, and pressure differences across pulmonary structures. However, in assessing the adequacy of artificial respiration in a patient one must take into account the individual's respiratory characteristics of distensibility and elasticity of the lungs and chest and the flow resistance of the lungs as they are affected by pulmonary vascular changes, tracheo-bronchial secretions, and other factors.

Artificial and natural respiration differ in their effects on the systemic circulation. The inspiratory aspiration of venous return in natural breathing is replaced by inspiratory inhibition of venous return by methods which cause elevation of intrathoracic pressure. This is of practical importance in proportion to the loss of vasomotor reactivity and other circulatory compensation mechanisms. An effect which is harmful in the presence of shock may be beneficial in the presence of pulmonary edema. A method which favors the circulation may be less effective than others in ventilating the lungs. Optimal use of different methods is therefore dependent upon knowledge of physiologic behavior of the organism.

This is an excellent review and of particular interest to physicians concerned with the maintenance of post-polio respirator patients.

Estimation of Uterine Blood Flow in Normal Human Pregnancy at Term. J. Metcalfe; S. L. Romney; L. H. Ramsey; D. E. Reid, and C. S. Burwell. J. Clin. Invest. **34**:1632 (Nov.) 1955.

Using a modification of the Fisk principle the authors have devised a method of estimating uterine blood flow. The method involves the administration of controlled concentration of nitrous oxide to the pregnant woman at term and the determination of nitrous oxide concentration in samples of blood drawn from the brachial artery and uterine vein simultaneously and frequently during a thirty-minute period of gas administration, and in amniotic fluid and umbilical arterial and umbilical venous blood at the moment of delivery by Caesarian section.

With this data, and on the basis of several necessary assumptions regarding the weight of the uterus, volume of amniotic fluid, and nitrous oxide equilibrium between the various tissues and their arterial blood slpply, it is possible to calculate the uterine blood flow. From the estimated uterine blood flow additional data may be derived, such as uterine O_2 consumption and CO_2 production, uterine RQ, fetal RQ, and an approximation of the volume of fetal blood flowing to the placenta.

The authors have attempted this procedure on twenty-five multiparous women and report data and calculated results on fourteen of these studies. The mean uterine blood flow of single pregnancies was found to be 492 cc./min. with a standard deviation of 195 cc./min. Only two of the calculated values were below 300 cc./min. and only three were above 600 cc./min.

Mean O_2 consumption is reported at 24.5 cc./min. and CO_2 production at 21.8 cc./min. This gives an average respiratory quotient in the uterus at term of 0.91. In one patient with a twin pregnancy the uterine blood flow and uterine O_2 consumption were approximately twice the magnitude of the average single pregnancies.

These results are compared with the reports of other investigators and a reasonable discussion of the discrepancies is presented. An accurate method of estimating uterine blood flow will permit the calculation of several important features of gestational metabolism.

Changes in Cardiac Output with Age. Martin Brandfonbrener; Milton Landowne, and Nathan W. Shock. Circulation **12**:557 (Oct.) 1955.

The authors report the results of their investigation of cardiac output in different age groups using a dye dilution method. Their findings are in contrast to those of investigators who used indirect gas analysis technics. This study is in excellent accord with others in which the direct Fisk technic was used.

Cardiac output was determined by a dye dilution technic in 67 males with an age range of 19 to 86 years. Subjects were selected as being free of relevant disease.

Cardiac output averaged approximately five liters per minute, with a standard deviation of 30 per cent. Part of this individual variation is attributable to age differences. The relationship between cardiac output and age is significant, showing a decrease in cardiac output amounting to about one per cent of the fifty-year value per year. Part of the decrease in output is associated with a decrease in body size and part with a decrease in the frequency of the heart beat, but about half is due to reduction in the blood pumped per beat per unit of body size.

The data in this study were collected with the subjects at as nearly basal state as possible. Further studies designed to show the age-wise differences in cardiac output in response to the stress of physical work of graded load intensities would be of considerable interest and would provide useful information in the clinical field of rehabilitation.

Assistive and Adaptive Apparatus for Upper Extremities. Robert L. Bennett, and Hazel Royall Stephens. Phy. Therapy Rev. **35**:626 (Nov.) 1955.

The authors have had extensive experience in the use of assistive and adaptive apparatus for upper extremities. The various types of apparatus were found to be useful in the rehabilitation of patients with poliomyelitis at Warm Springs Foundation.

"Feeder" is the term used to designate all types of apparatus which bring the hand toward the head by means of a device under the forearm and/or elbow. The advantages, disadvantages, and construction of the feeders are described in detail. They are well illustrated. Exercises to develop skill in using them are listed.

This material should be very helpful to workers in physical medicine and rehabilitation.

Cardiac Output During Muscular Work and Its Regulation. Erling Asmussen, and Marius Nielsen. Physiol. Rev. **35**:778 (Oct.) 1955.

Data relating circulatory functions such as cardiac output, stroke volume, pulse rate and arteriovenous oxygen difference to oxygen uptake are collected and presented. The large difference found between the results of the different investigators can probably be explained by the different state of physical training of the subjects used.

From roentgenological studies of the diastolic heart volume and from measurements of auricular pressures and determinations of the amount of residual blood in the heart, it appears that increase in stroke volume during muscular work probably does not result from a Starling effect on a more distended heart but is brought about by more complete emptying of the heart. However, changes in body position, hemorrhage, dehydration, or physical training can produce changes in stroke volume in accordance with the Starling law of the heart.

The authors conclude from available data that the increase in cardiac output cannot be looked upon as being merely a link in the regulation of arterial blood pressure. They feel that a stimulus closely correlated to the intensity of work and possibly of peripheral nervous origin influences the circulatory centers in such a way that there is a relative increase in sympathetic tone. As a result the heart frequency is increased and the emptying of the heart becomes more complete. The resultant increase in blood flow from the heart will return to the heart through the dilated vessels of the working muscle assisted only by the venous pump. From data available only for light and moderate work it seems that an emptying of venous depots is not necessary in order to increase the cardiac output. The vasoconstriction in resting organs observed in heavy work is presumably elicited by the previously mentioned stimulus, possibly from special receptors in the working muscles.

The Effect of Repeated Muscular Exertion on Muscle Strength. H. D. Darcus, and N. Salter. J. Physiol. **129(2)**:325 (Aug. 29) 1955.

The authors studied two methods of increasing muscular strength by training subjects in pronation and supination of the hand and flexion of the elbow. "Static" training where an isotonic contraction holds a load in one position was compared with "dynamic" training where an isometric contraction moves a load through some distance. Both types of training produced increased isotonic and isometric muscle strength although the effects of static training were delayed. Dynamic training produced a greater percentage of improvement, possibly because the subjects were better motivated. Subjects became bored by static training. The muscles so trained and their antagonists on the same side were strengthened, as were the same contralateral muscles.

Book Reviews

The reviews here published have been prepared by competent authorities and do not necessarily represent the opinions of the American Congress of Physical Medicine and Rehabilitation and/or the American Academy of Physical Medicine and Rehabilitation.

TEXTBOOK OF PHYSIOLOGY. Edited by *John F. Fulton*, M.D. 17th edition. Cloth. Price, $13.50. Pp. 1275, with 600 illustrations. W. B. Saunders Company, West Washington Sq., Philadelphia 5, 1955.

The 17th edition of Fulton's Textbook of Physiology brings up to date many of the newer concepts of physiology in one textbook. Of particular importance to the physiatrist are the sections on muscular and nervous activity. These in this edition have been rewritten completely and are outstanding in both detail and clarity. The physiology of muscular activity presents much of the work of Szent-Gyorgy, Mommerts and A. V. Hill with adequate simplification of a very complicated subject. The section on neural conduction and reflex activity will provide a good basic foundation to the student interested in the physiology of the lower motor unit.

The discussions of primitive and complex central nervous system activities are well-written and comprehensive.

The section on respiratory physiology covers the basic concepts with modifications indicated by recent studies in the laboratory.

In summary this basic textbook which is used in many of the medical schools today is a very excellent text and reference book of physiology. It is well documented and accurate. This book can be highly recommended to all physicians as an up-to-date reference and particularly to the physiatrist with regards to the sections discussed above.

ANCIENT THERAPEUTIC ARTS: THE FITZPATRICK LECTURES DELIVERED IN 1950 and 1951 AT THE ROYAL COLLEGE OF PHYSICIANS. By *William Brockbank*, M.D. Cloth. Price, $5.00. Pp. 162. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., (n. d.).

Generously illustrated with facsimile reproductions of pictures and documented with many verbatim quotations, this book will be welcomed by every student of the history of medicine. The first three sections deal with enema administration, with cupping and leeching, and with counter-irritation; the fourth section is entitled "The Less Ancient Art of Intravenous Injection of Drugs." Among the memorable items is a description (p. 130) of the last days of Charles II of England, who died despite a regime of venesection, cupping with scarification, purgatives, enemas, sneezing powder, cephalic plasters, spurge and Burgundy pitch, blistering agents "applied all over his head after his hair had been shaved," and red-hot cautery.

The occasional reading of a book of this kind is salutary reminder of the perpetual danger to medicine that lurks in the uncritical use of accepted procedures. In the past their use has often continued for decades in situations where they did more harm than good. A new remedy has often had to wait long for some courageous physician to give it a systematic, unprejudiced trial. But often, too, humanity has had to wait long for some courageous physician to publish negative results.

KINESIOLOGY OF THE HUMAN BODY UNDER NORMAL AND PATHOLOGICAL CONDITIONS. By *Arthur Steindler,* M.D. Cloth. Price, $19.75. Pp. 708, with illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1955.

Dr. Steindler has produced another remarkable book containing a mass of material. He has tried to avoid the application of mechanics with its difficult mathematical formulae in order to make the book more readable. He is convinced that Kinesiology is an indispensable background for the prevention, the treatment, and rehabilitation of locomotor disorders. "Kinesiology is that part of physiology of motion which describes and analyzes locomotor events as far as they reflect the action of mechanical forces. In other words, it presents bodily motion as a special case in mechanics." "Can human motion — be forced into the narrow frame of precise and austere mathematical and physical laws?" The purpose is to interpret the operation of known physical laws in a deductive manner as they apply to human locomotion. It may be that the interpretation of the law is incorrect as applied to locomotion. "The danger then lies not in failing to recognize that a mechanical law is operating but rather in overlooking the existence of other laws, not mechanical in nature, which have their share in human locomotion." Though there are many inaccuracies where mechanical laws are applied to the body, the effect of mechanical forces on the human locomotion is so strong and dominant that even the aggregate inaccuracies do not vitiate the practical value of mathematical computations. The many methods by which locomotion can be studied have increased the knowledge to a remarkable extent.

In detail, the physical properties of bone, cartilage, muscles, fascia and tendons are discussed; the mechanics of joint and muscle action; and finally the pathomechanics of static deformities, and of paralyses as they apply to the body as a whole and to all individual joints, spine, upper extremity and lower extremity are described and illustrated. From the application of mechanical principles, treatment is deduced.

It is a book loaded with valuable material as one would expect from the pen of Dr. Steindler and one that should be available for ready reference at all times.

A SHORT HISTORY OF MEDICINE. By *Erwin H. Ackerknecht,* M.D. Cloth. Price, $4.50. Pp. 258. The Ronald Press Company, 15 E. 26th St., New York 10, 1955.

This book is not a biographical history of the men in medicine but rather a history of the philosophy of medical and clinical practice. It unfolds the development of the ancient art from paleopathology and legend up through the ages by the new methods of science and deduction.

From the point in history, where records were first kept, the story is more reliable but the trends of medicine are followed as a growth of its own history. It is of interest to find the mind of man expanding with the accumulation of historical data. However, it is somewhat difficult to follow his logic even though one realizes that the background was sparse and medical education was unheard of.

The modern concepts of medicine are of less interest in this book, primarily because of the small amount of space allotted to it. The author's reason for this is logically that it has been done by others before.

On the whole a very interesting book to read, not too detailed and a fine background for the medical profession.

BONE AND BONES. FUNDAMENTALS OF BONE BIOLOGY. By *Joseph P. Weinmann,* M.D., and *Harry Sicher,* M.D. Second edition. Cloth. Price, $13.75. Pp. 508, with illustrations. The C. V. Mosby Company, St. Louis, 1955.

The authors of this comprehensive book have presented the subject matter on the basis of "biologic principles." The text is devoted to a discussion of the normal and pathologic behavior of the skeleton.

Bone is described as a tissue and bones as organs comprised of multiple tissues serving as elements of the skeleton. This differentiation is the basis for the title, "Bone and Bones."

The subject matter is presented in a systematic manner and profusely illustrated with photographs and excellent photomicrographs supporting the text. There is considerable emphasis on the dental aspects particularly as it pertains to the pathologic processes involving the mandible and teeth.

Wolff's Law of Transformation is discussed as a skeletal adaptation to altered forces producing changes in shape and structure in the growing skeleton and a reorientation of the structural elements in the mature individual. Various deformities are considered on this basis. Scoliosis is presented as an adaptive deformity involving the vertebrae and ribs caused by changes in the vertical load or by tension of muscles and other secondary structures. In Erb's palsy, the authors suggest that the fibrosed muscles might prevent lengthening of the bones rather than lack of function. Muscle exercise makes a "bone stronger but not longer."

Considerable attention is devoted to the endocrine and dietary skeletal disturbances as well as to a comprehensive discussion of tumors of bone. The illustrations are excellent and well placed in the text.

This book is an excellent reference volume particularly for institutions where there is a multiple interest in the subject matter.

TREATMENT IN PSYCHIATRY. Third edition. By *Oskar Diethelm*, M.D. Cloth. Price, $9.50. Pp. 545. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1955.

Treatment in Psychiatry is the third edition of a textbook written by Dr. Oskar Diethelm, Professor of Psychiatry, Cornell University Medical College. Other editions were published in 1936, 1950, and in 1955. The book reflects the wide experience of the author in the field of psychiatry. He continually stresses the importance of accurate diagnosis in both physical and mental spheres, as well as the treatment of the patient and his disease.

The author does not use the word psychosis because it cannot be defined beyond "disorder of personality." He makes every effort to question that which is accepted, and to accept only that which has been subjected to critical evaluation, in the light of the knowledge of our times.

In the chapter on study of personality, methods of study are presented with the realization that an experienced examiner may develop and use his own methods.

Respect of the confidence of the patient is emphasized. Psychiatry is admitted to be a part of total medical practice, most effective when used along with physical evaluation.

In the discussion of psychotherapeutic procedures, the author expresses himself concerning psychological testing as follows: "Despite the large number of psychological tests especially of the projective type which have been in use in recent years, their usefulness in therapy is most limited. A good clinician will usually obtain in the course of a careful investigation the dynamic material which is indicated in the tests."

Dynamic psychotherapy is presented in a forceful manner. "Treatment should result in the understanding of oneself, which implies a willingness to limit one's goals according to one's abilities which one has learned to recognize and evaluate."

There is a chapter on depressions which will prove most useful to the physician engaged in general supervision of any group of patients.

The author uses the term "Psychoneuroses" to describe a very wide range of mental illness and to advise that the term is a poor one. He warns that many psychoneurotic reactions are early manifestations of depressive and schizophrenic illness and structural disorders.

The new edition briefly discusses the use of chlorpromazine and Reserpine in the treatment of excitements and excessive fear states.

The book is without illustrations. There is a limited bibliography following each chapter. This book will aid any physician in a better understanding of the methods and goals of treatment in psychiatry.

ORTHOPADISCHE KRANKENGYMNASTIK. Lexikon Und Kompendium. By *Martha Scharll*. Papêr. Price, $3.50. Pp. 174, with illustrations. Georg Thieme Verlag, Stuttgart, Germany; Intercontinental Medical Book Corporation, New York 16, 1955.

As noted in the foreword by Prof. Hohmann, the author of this book is abundantly qualified by virtue of extensive experience in corrective gymnasium work both as a therapist and as a teacher of therapists. The book is unusual in that it begins with a 58-page glossary, mainly of terms from orthopedics; this feature, intended to aid readers unfamiliar with the orthopedic vocabulary will also be helpful to foreign readers. In this connection one notes with disappointment (pp. 16 and 30) that German usage has followed the American in the arbitrary, stupid misuse of the words "concentric" and "eccentric" to describe certain kinds of muscular work; it ought to be possible to find less misleading terms, preferably new, but at least suggesting what is intended.

The second part is a discussion of a selected list of orthopedic conditions as they confront the therapist. It includes disorders of the foot, hip, shoulder, vertebral column, and neck, also paralyses, contractures, osteochrondosis, and faults of posture and gait. The remainder of the book goes into details about exercises and manipulations. It is attractively illustrated with both photographs and line-drawings. There is a bibliography of related German publications and a good index. The book will be found full of suggestions for those who prescribe or administer therapeutic and corrective exercise.

PERIPHERAL VASCULAR DISEASES. By *William S. Collens*, M.D., and *Nathan D. Wilensky*, M.D. Leatherette. Second edition. Price, $12.00. Pp. 622, with 366 illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1953.

In the fifteen years since publication of the first edition of this book, there have been many advances in diagnosis, treatment, and rehabilitation of patients suffering from peripheral vascular diseases. For the most part, the authors in the present edition have kept current with latest developments in this field.

The book is generally divided into two parts. The first part deals with the anatomy and physiology of peripheral arterial pathways, with methods of examination, symptoms, and signs of interference with arterial flow. Subsequent chapters are devoted to classification and description of various types of arterial diseases, and differential diagnosis between vascular and non-vascular conditions. The latter and greater half of the book comprises a description of the various types of treatment. The chapter on physical methods of treatment is adequate, although in discuss-

ing the local use of diathermy in vasospastic states, the authors fail to caution the reader as to the dangers of such application in organic obstruction and no mention is made of pelvic diathermy for reflex vaso-dilatation. As might have been expected in view of the authors' contributions to the subject, considerable space is devoted to intermittent venous occlusion, in spite of the mounting literature negating the value of this modality.

Discussion of the prevention of phlebothrombosis and pulmonary embolism also fails to mention the use of post-operative sinusoidal stimulation of calf muscles.

The book is readable and recommended to students and physicians interested in this field.

THE SPINO-CEREBELLAR DEGENERATIONS. By *J. G. Greenfield,* M.D. Cloth. Price, $4.00. Pp. 112. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1954.

Dr. Greenfield, the eminent neuropathologist of the National Hospital for Diseases of the Nervous System, Queen Square in London has added a monograph, describing the spino-cerebellar degenerations, to his long list of important publications.

After a summary of the present concepts of the anatomy and physiology of these parts of the central nervous system, a critical review of the literature attempts to unravel the many conflicting views held. This results in a classification of the spino-cerebellar degenerations, which appears logical and clarifying.

A recent addition to this group of diseases is the condition described by Biemond. Several members of the family described by Biemond showed an ataxic disturbance, due to affection of the posterior columns, without other signs of spino-cerebellar degeneration.

An extensive, well-organized bibliography concludes this excellent monograph.

BONE: An Introduction to the Physiology of Skeletal Tissue. By *Franklin C. McLean,* M.D., and *Marshall R. Urist,* M.D. Cloth. Price, $6.00. Pp. 182, with illustrations. The University of Chicago Press, 5750 Ellis Ave., Chicago 37, 1955.

This monograph is the result of some twenty years of study by Dr. McLean, Professor Emeritus of Pathological Physiology, the University of Chicago, and Dr. Urist, Associate Clinical Professor of Orthopedic Surgery, University of California at Los Angeles. It deals primarily with the physiology and biochemistry of bone. It is concerned with bone as a tissue rather than with its mechanical function in providing the skeletal support of the body. It starts with a chapter on bone as a tissue and continues with the histogenesis of bone, the structure and chemical composition of the bone matrix, which includes information with regard to collagen, ground substance and reticulin. The chemistry and crystal structure of the bone mineral, the dynamics of calcification, the enzymes and bone with their relationships, and the resorption of bone. There is a chapter on the hormones and bone which deals with the parathyroid hormone, the estrogens, the growth hormone, androgens and gonadotropins, thyroxin, corticotropin and cortisone, and dwarfism. The chapter on mineral metabolism deals with the calcium, phosphorus and calcium; and phosphorus balance with bone as a reservoir of minerals and with the vitamins. A chapter on radiation, isotopes and bone deals with the metabolism of elements with special affinity for bone, with fixation of elements by the skeleton with fission products, absorption, and removal of isotopes from the bone. It also discusses the effects of radiation upon bone, both external and internal. The chapter on post-fetal osteogenesis deals with tissue culture, transplants and ectopic bones. The complete physiology of the healing of fractures is discussed from the first hemorrhage through to the final healing, ending with a chapter on the pathologic physiology of bone, dealing with atrophy, osteoporosis and rarefaction of bone, with rickets and osteomalacia and with hyperparathyroidism.

The bibliography is by chapters. The monograph is good as a whole and can be picked up for special reference as each chapter is individual unto itself.

AMERICAN ACADEMY OF PHYSICAL MEDICINE AND REHABILITATION

Officers and Committees
1956

President — Ben L. Boynton
President-Elect — Murray B. Ferderber
Vice-President — George D. Wilson
Secretary-Treasurer — Max K. Newman

Board of Governors

Ben L. Boynton
Murray B. Ferderber
Louis B. Newman
Max K. Newman
Ray Piaskoski
George D. Wilson
Ralph E. Worden

Advisory Committee

Frank H. Krusen, Chairman
William D. Paul, Vice-Chairman
Ben L. Boynton
Harold Dinken
Murray B. Ferderber
Gustave Gingras
Miland E. Knapp
A.B.C. Knudson
Lewis A. Leavitt
Louis B. Newman
Max K. Newman
Ray Piaskoski
George D. Wilson
Ralph E. Worden

By-Laws

Earl C. Elkins, Chairman
Robert W. Boyle
Miland E. Knapp
Frederic J. Kottke
Donald L. Rose

Membership

Robert W. Boyle, Chairman
Hans J. Behrend
A.B.C. Knudson

Nominating

Arthur C. Jones, Chairman
Morton Hoberman
Herman Rudolph

Program

Fritz Friedland, Chairman
Frances Baker
Charles Wise

Liaison with Association of American Medical Colleges

William D. Paul, Chairman
Robert L. Bennett
James W. Rae, Jr.

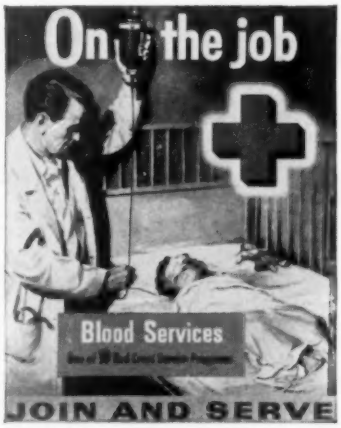
Liaison with American Hospital Association

Donald J. Erickson, Chairman
Clarence W. Dail
Florence I. Mahoney

Study of Disability Group Insurance Plan

Walter J. Zeiter, Chairman
Max K. Newman
Ferdinand F. Schwartz

THE NATIONAL SOCIETY FOR CRIPPLED CHILDREN AND ADULTS, INC.
11 S. LASALLE STREET, CHICAGO 3, ILL.



Specialists in Electro Medical Equipment for Physical Therapy, Rehabilitation and Diagnosis

ELCO

FRED LANDAUER CO.

11 BLENHEIM COURT
ROCKVILLE CENTRE, L. I., NEW YORK
Tel. RO 6-4527

THEA

REPRESENTING LEADING MANUFACTURERS

Dependable Repair Service

Liberal Trade-Ins

Consultant Service for planning new departments

We buy and sell Good Used Equipment

ARCHIVES AVAILABLE ON MICROFILM

The ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION is now available to libraries on microfilm. A microfilm edition will be sold only to bona fide subscribers of the ARCHIVES, is not for resale and will be distributed at the end of the volume year.

For further information, inquiry should be directed to UNIVERSITY MICROFILMS, 313 North First Street, Ann Arbor, Mich.

REGIONAL OFFICERS

AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION

EASTERN SECTION—Chairman, Jacob L. Rudd, Boston; Secretary, Harold Lefkoe, 857 Meeting House Road, Jenkintown, Pa.

States represented: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont.

MIDWESTERN SECTION — Chairman, David Paul, Iowa City; Secretary, William D. Paul, Poliomyelitis and Rehabilitation Unit, Children's Hospital, Iowa City.

States represented: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota and South Dakota.

WESTERN SECTION — Chairman, Fred B. Moor, Los Angeles; Secretary, Roy H. Nyquist, Physical Medicine Section, Paraplegia Service N-1, VA Hospital, Long Beach 4, Calif.

States represented: California and Nevada.

NORTHWESTERN SECTION—Chairman, Albert L. Cooper, Seattle; Secretary, Sherburne W. Heath, Jr., 757-60 Medical-Dental Building, Seattle 1.

States represented: Idano, Montana, Oregon and Washington.

ROCKY MOUNTAIN SECTION — Chairman, Carl C. Hoffman, Denver; Secretary, Lt. Col. Aniello F. Mastellone, Fitzsimons Army Hospital, Denver.

States represented: Arizona, Colorado, New Mexico, Utah and Wyoming.

CENTRAL SECTION—Chairman, Paul A. Nelson, Cleveland; Secretary, Mieczyslaw Peszczynski, 2961 S. Moreland Blvd., Cleveland 20.

States represented: Illinois, Indiana, Kentucky, Michigan, Ohio, West Virginia and Wisconsin.

SOUTHERN SECTION — Chairman, Nathan H. Polmer, New Orleans; Secretary, Solomon Winokur, 4729 Prytania St., New Orleans 15.

States represented: Arkansas, Louisiana, Mississippi, Oklahoma and Texas.

SOUTHEASTERN SECTION — Chairman, Harriet E. Gillette, Atlanta; Secretary, Louis P. Britt, 869 Madison Ave., Memphis, Tenn.

States represented: Alabama, Florida, Georgia, North Carolina, South Carolina, Tennessee and Virginia (District of Columbia).

SPECIALIST IN PHYSICAL MEDICINE REQUIRED FOR Rehabilitation Centre, Regina, Saskatchewan. Present daily caseload is 65, mainly polio and cerebral palsy. Staff includes Physical Therapists, Occupational Therapists, Speech Therapists, Teacher Therapists and Social Workers. Position offers excellent scope for keen well-qualified Doctor.

Salary range $8,316. - $9,936. Suitable superannuation scheme. For further details and information, contact immediately Public Service Commission, Legislative Buildings, Regina, Saskatchewan, or Personnel Officer, Provincial Health Building, Regina, Saskatchewan, Canada.

Competition closes as soon as a qualified applicant is obtained.

SELECTED OPPORTUNITIES

WANTED—PHYSICAL THERAPISTS: (a) 2-man clin grp specializing arthritis treatments; well known resort twn 50,000; SW. (b) Head new dept; excel oppty org & est dept; 250 bd gen hosp; coll twn 75,000; MW. (c) Exp not req'd; 60 bd hosp for chronically ill; cons paralysis work; excel facil; $350; coll twn; NM. (d) Staff; 600-bd gen hosp, fully apprv'd; lge city; E. (e) Vol gen hosp 150 bds; lovely twn; Pac NW. (f) Head dept; 250-bd gen hosp; to $5700; coll city 50,000; MW. (g) Staff; 250 bd gen hosp; new 500 bd hosp now u/constr; county seat twn 50,000; W. (h) Vol gen hosp 60 bds; coastal twn; Calif. (i) 2 req'd; new 65-bd rehab unit for children; affil 300 bd teach'g hosp; lge univ city; MidE. (j) Two; req'd; grp of 8 orth surg; outstand'g facil & equip; excel loca; Pac NW. (k) Head dept; 200 bd gen hosp; apprv'd JCAH; coll twn 30,000; NW. (l) 2 req'd; lge & well-known clin grp; excel dept facil & equip; to $5000; univ city 50,000; MW. (m) Consultant; state hlth dept; all admin & org duties; cons travel req'd $4800; city 30,000; W.

Please send for an Analysis Form so we may prepare an individual survey for you. We offer you our best endeavors — our integrity — our 60 year record of effective placement achievement. Strictly confidential. Woodward Medical Bureau, 185 N. Wabash, Chicago.

— WANTED —

Immediate placement for registered, qualified physical therapists (male or female) for rapidly expanding physical medicine and rehabilitation institute serving two hospitals, total 1000 general medical and surgical beds, in largest centrally located industrial center in Illinois.

Write: Administrator, Institute of Physical Medicine and Rehabilitation, 619 N. Glen Oak Ave., Peoria, Ill.

BUY

BONDS!

No other medical periodical gives you such "wide coverage" in the field of physical medicine and rehabilitation as THE ARCHIVES

If you are a teacher of physical medicine, a research worker, a physicist, or just a clinician — if you want to stay abreast of all that is new in physical medicine and rehabilitation — you *must* read THE ARCHIVES.

Each month you will find in this journal informative articles, constructive editorials, physical medicine news, announcement of new books and a wealth of abstracted material dealing with every phase of physical medicine and rehabilitation.

If you are not a subscriber to THE ARCHIVES—send in your subscription today. Sample copy will be sent on request. Subscription price $7.00 per year; Canada, $8.00; elsewhere, $14.00 the year.

AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION,
30 No. Michigan Ave., Chicago 2.

Please find enclosed check for $7 ☐ or bill me ☐ for one year's subscription to the ARCHIVES.

Name.....

Address.....

City, Zone and State.....

PRESTON

A Complete Line

FOR PHYSICAL MEDICINE AND REHABILITATION

REHABILITATION: Walking Parallel Bars and Exercise Staircases of various designs; **Posture Mirrors,** single & triple; **Gymnasium Mats** in various thicknesses and coverings; **Bicycle Exercisers;** Restorator; **Progressive Resistance Exercise Units;** Quadriceps-Gastrocnemius-Footdrop Boots; Dumbbells; Indian Clubs; **Wall Pulleys;** Door Pulley Assemblies; **Guthrie-Smith Suspension Apparatus;** Stall Bars; **Shoulder Wheels** with height adjustment; Manuflex, Kanavel Table; **Sayre's Headslings;** Ankle Exercisers; **Treatment Tables;** Timers.

HYDROTHERAPY - ELECTROTHERAPY: Whirlpools for every use; Hubbard Tanks; **Paraffin Baths; Hydrocollator;** Shortwave Diathermy; Galvanic - faradic - sinusoidal Generators; Ultraviolet Lamps; **Infrared Lamps and Bakers; Ultrasonic Generators.**

DIAGNOSTIC APPARATUS: Chronaximeters; Dynamometers; Goniometers; Oscillometers; Thermocouples and Skin Thermometers.

INVALID EQUIPMENT: Everest & Jennings Wheelchairs; Hollywood Wheelchairs; Commodes; **Walkers;** Patient Lifters; **Standing (Tilt) Tables;** Stretchers; Largest selection of **Crutches and Canes.**

COMPLETE LINE OF CEREBRAL PALSY FURNITURE AND EQUIPMENT - SPEECH THERAPY - SELFHELP DEVICES.

New Items of Interest

Literature Upon Request

Guthrie-Smith Universal Sling Suspension Apparatus. Standard and Portable Models; complete with all springs, ropes, pulleys, slings, etc. **$295.00**

Preston Stationary Bicycle Exerciser. Adjustable resistance —mileage indicator and speedometer—adjustable for use by adults and children. **$59.80**

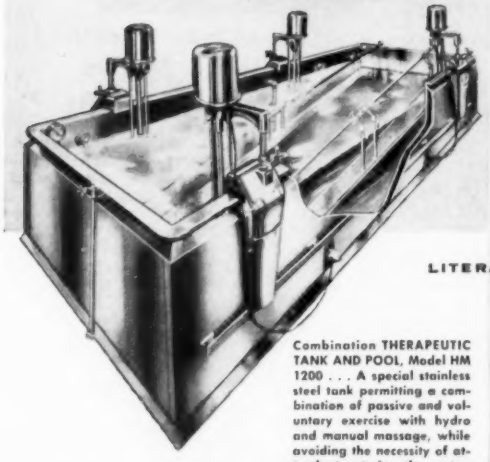
Write for your free copy of illustrated Catalog No. 1056. Inquiries Invited.

ALL your needs supplied by ONE reliable source

J. A. PRESTON CORP.
175 FIFTH AVENUE, NEW YORK 10, N. Y.

ILLE

ENGINEERED for efficient, economical service



Combination THERAPEUTIC TANK AND POOL, Model HM 1200 . . . A special stainless steel tank permitting a combination of passive and voluntary exercise with hydro and manual massage, while avoiding the necessity of attendant entering the water.

Combination ARM, LEG AND HIP TANK, Model HM 601 . . . Stationary, stainless steel unit for hydromassage and subaqua therapy. Water mixing valve is thermostatically controlled.

LITERATURE ON REQUEST

Hudgins MOBILE SITZ BATH, Model SB 100 . . . For hospital, clinic or office use . . . sturdy stainless steel and aluminum . . . easy to clean and assemble. Electric heater (optional) maintains temperature of solution.

ILLE ELECTRIC CORPORATION
50 MILL ROAD, FREEPORT, L. I., N. Y.

HYDROCOLLATOR

Steam PACK

MOIST HEAT

Now moist heat can be applied conveniently, effectively and with a minimum investment in equipment. No dripping, no wringing, no repeated applications. Each application gives at least 30 minutes effective moist heat. The Steam Pack is merely heated in water, wrapped in a towel, and applied. Standard equipment in leading hospitals and clinics across the nation.

DESCRIPTIVE MATERIAL ON REQUEST

CHATTANOOGA PHARMACAL CO., INC.

CHATTANOOGA 5, TENNESSEE

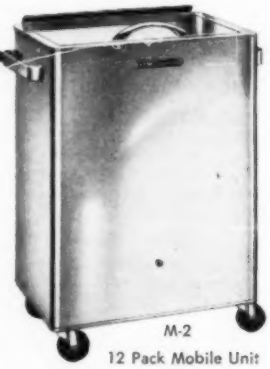
MASTER UNITS

Four all stainless steel models tc meet the various requirements in hospitals, clinics, physicians' offices, and patients' homes. Automatically maintains Steam Packs in water at proper temperature — constantly ready for immediate use. No plumbing used.

D-3 2 Pack

E-1 4 Pack

SS — 6 Pack



M-2 12 Pack Mobile Unit

HANOVIA LUXOR ALPINE LAMP

Invaluable Aid in Effective Treatment of Psoriasis

The Goeckerman technique (crude tar and ultraviolet radiation) is very helpful in many cases. Ultraviolet light produces a definite chemical change in the tar. This combination is reliable and effective.

In hospitals, in offices, Hanovia's Luxor Alpine lamp has proven an invaluable aid in treatment of lupus vulgaris. Exposure of the lesions of erysipelas, and wide area of surrounding tissue, has been shown to have beneficial effect. Markedly beneficial too, in treatment of acne vulgaris, pityriasis rosea, impetigo, dermatitis herpetiformis, furunculosis, herpes zoster, circumscribed and disseminated neurodermatitis and indolent ulcers, and also effective in treatment of Decubiti.

HANOVIA AERO-KROMAYER LAMP

Air-Cooled Ultraviolet Lamp for Local and Orificial Application

Cooled by air instead of water, using new principles of aero-dynamics, the Hanovia Aero-Kromayer Lamp provides the most minute and accurate control of any required degree of clinical actinic reaction on skin surfaces or within the body cavities. A very intense source of focused ultraviolet energy, the Hanovia Aero-Kromayer Lamp can produce a first-degree erythema in 2 seconds when in contact with the average untanned skin. May be tilted up or down sharply while lighted — operated in any position — without decreasing its ultraviolet emission. An invaluable facility for orificial work.

Ask your surgical dealer for a demonstration.

50th Anniversary **HANOVIA** WORLD LEADER IN ULTRAVIOLET FOR HALF A CENTURY

HANOVIA CHEMICAL & MFG. CO. 100 CHESTNUT STREET, NEWARK 5, NEW JERSEY

AN ENGELHARD INDUSTRY

YOURS ON REQUEST: Authoritative treatises describing ultraviolet in various conditions. Write for your brochures today. No obligation.

Dept. PMR-2.

Immobilize the entire lower back area

with CAMP

LUMBOSACRAL SUPPORTS

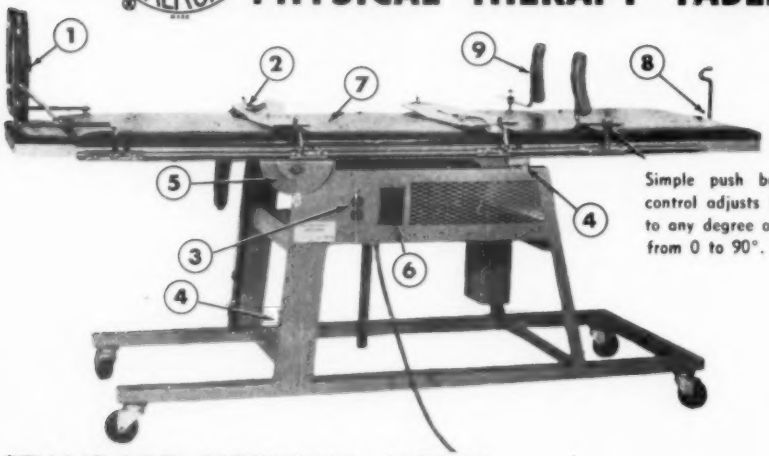
Camp Lumbosacral Supports cover and support the complete lumbar and sacral regions of the back. Their precise design in a wide range of styles and sizes permits authorized Camp dealers to stock the supports . . . eliminating delays caused by waiting for "special" manufacture. Their lower cost and comfort makes them especially attractive to your patients. Additional steels may be easily added for extra reinforcement. Camp's well-known "block and tackle" lacing adjustment feature increases the force that can be exerted by two to three times because of a three to one mechanical advantage.

S. H. CAMP and CO., Jackson, Mich.
World's Largest Manufacturer of Anatomical Supports
OFFICES: 200 Madison Ave., New York; Merchandise Mart, Chicago
FACTORIES: Windsor, Ontario; London, England

TO MAKE PRESCRIBING OF CAMP SUPPORTS EASIER WRITE FOR YOUR COPY OF THE PHYSICIANS AND SURGEONS REFERENCE BOOK FOR ADDITIONAL DETAILS ON THE COMPLETE CAMP LINE.

La Berne

WALK-OFF PHYSICAL THERAPY TABLES



Simple push button control adjusts table to any degree of tilt from 0 to 90°.

STANDARD HOSPITAL MODEL

IMPORTANT FEATURES

1. Adjustable foot board
2. Adjustable restrainer straps
3. Push button switch
4. Safety switches
5. Calibrated dial for degree of tip
6. Receptacles for auxiliary equipment
7. Table top sponge rubber with easy-to-clean plastic cover
8. Adjustable cervical traction holder
9. Adjustable crutch

   Adjustable arm slings

With the LaBerne Table patients can be handled by one attendant. A task that was formerly difficult even for a team. Patients benefit from more effective exercises, added confidence.

THERE ARE 6 MODELS
OF WALK-OFF TABLES
ONE TO FIT ANY BUDGET

HOME MODEL WALK-OFF TABLE

This model was designed because of many requests from polio centers for a "Walk-Off" table for home use. All metal with a walnut finished top and removable foot-board, it is mounted on 3" casters with locks. Hand operated and adjustable to any degree of tilt from horizontal to vertical. Calibrated dial shows degree of tilt from 0° to 90°. FOB Columbia, S. C. $195.00

Write for illustrated brochures to:

La Berne Manufacturing Company, P. O. Box 5245, Columbia, S. C. Phone 2-8609

Georgia Warm Springs Foundation

GRADUATE COURSE

Physical Therapy and Occupational Therapy
in the Care of Poliomyelitis

This course is open to graduates of approved schools in physical therapy and occupational therapy. Such graduates must be members of the American Physical Therapy Association and/or the American Registry of Physical Therapists and Occupational Therapy Association.

Tuition: None. For Scholarship to Cover Transportation and Maintenance, Contact National Foundation for Infantile Paralysis, 120 Broadway, New York 5, New York.

Entrance Dates: First Monday in January, April, July and October.

Duration of Course: The Course is divided into two parts:

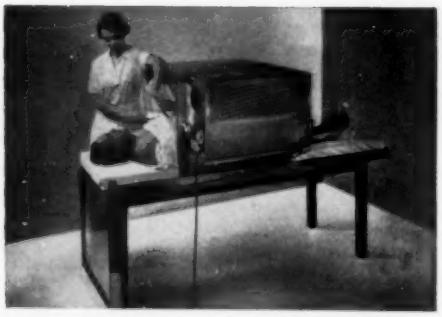
Part I. Over-all care of convalescent polio with particular emphasis and special training in muscle testing and muscle reeducation.

Part II. Particular emphasis and special training in functional testing and functional retraining.

Each Part lasts three months and only selected students who have completed Part I will be admitted to Part II. All students applying for Part I must be willing to remain through Part II if selected.

For Information Write:

ROBERT L. BENNETT, M.D.
Georgia Warm Springs Foundation
WARM SPRINGS, GEORGIA



MOISTAIRE
The Original Heat Therapy Unit

UNEXCELLED
for the delivery of moist heat at the exact prescribed temperature.

COMFORT • SAFETY • DURABILITY

- A physiologically sound and safe method for the treatment of sprains, fractures, and other industrial and orthopedic problems.
- Used consistently since 1937.

For illustrated information write, wire or call:

The **RIES** *Corporation*

3508 FIFTH AVE., PITTSBURGH 13, PA.

Now... precise, repeatable, easily obtained results for...

electrodiagnosis and prognosis

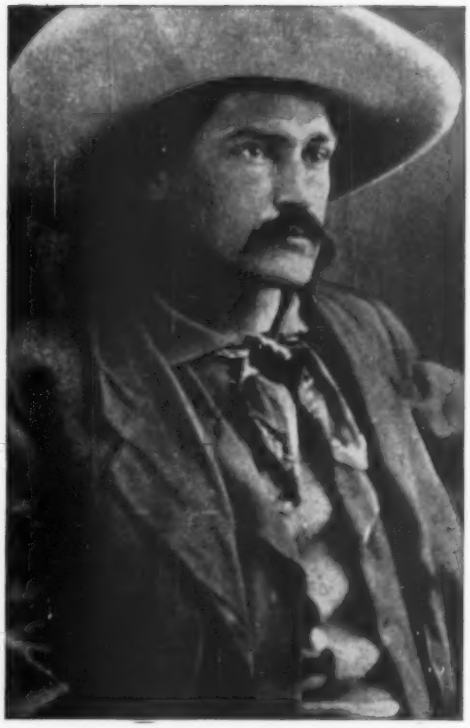
of neuromuscular disorders

MODEL **CH-3**
VARIABLE PULSE GENERATOR and CHRONAXIE METER

new advanced electronic design • performs chronaxie tests • strength duration curves • other electrodiagnostic procedures!

In chronaxie tests, procedures are simplified . . . results are obtained with minimum instrument manipulation, through *automatic current-doubling.* All testing procedures are expedited . . . results are accurate, repeatable, meaningful. The new automatic constant current control circuit eliminates error due to variations in patient and electrode resistance Also, peak output pulse current is constantly clearly indicated on a large meter to further facilitate electrodiagnosis. *For complete information, write:*

teca corporation
80 Main St. • White Plains, N. Y.



His calling card had claws on it

LUTHER KELLY lied about his age and got into the army at 15. They sent him West in 1865, and he stayed.

He liked the wilderness. Game abounded. In Trappers' Lake, "trout were so thick they obscured the bottom."

Hostile Indians were also pretty thick. But when two tried ambushing him, he killed both with his Henry .44.

He learned Sioux and sign language, read Shakespeare and Scott.

One day, he visited General Miles, sending a huge fierce-clawed bear's paw to Miles' tent as his calling card. Miles made him chief army scout against the Sioux.

But by 1885, the country was taming down, and Yellowstone Kelly left it.

Two decades later, Teddy Roosevelt praised the heroic treasurer of Surigao in the Philippines who saved the town from outlaws. Name: Luther S. Kelly.

Yellowstone Kelly's body now rests at Kelly Mountain in Montana. But his restless, pioneering spirit lives on in today's America. For it is the trail-blazing courage of 165 million people that makes America great, and that provides the real strength behind one of the world's finest investments: our country's Savings Bonds.

Why not guard your security with this strength? Invest in U. S. Series E Savings Bonds. And hold on to them!

It's actually easy to save money—when you buy Series E Savings Bonds through the automatic Payroll Savings Plan where you work! You just sign an application at your pay office; after that your saving is done *for* you. The Bonds you receive will pay you interest at the rate of 3% per year, compounded semiannually, when held to maturity. And *after* maturity they go on earning 10 years *more*. Join the Plan today. Or invest in U.S. Savings Bonds regularly where you bank.

Safe as America— U.S. Savings Bonds

The U.S. Government does not pay for this advertisement. It is donated by this publication in cooperation with the Advertising Council and the Magazine Publishers of America.

Make Your Own Orthopaedic Appliances

with the new DIREKT-FORM

Cervical collar shown here was designed and constructed of Direkt-Form by A. Orthopedic Appl. Co., 450 2nd, N.Y.C.

DIREKT-FORM aluminum-alloy wire and woven fiber mesh is a new, patented material. The mesh is easily formed directly to the body of the patient. This molded form is then dipped into the plastic hardener. Also, the DIREKT-FORM method has a unique advantage over plaster. A special softener is supplied which permits reshaping or adjustment of a semifinished or finished DIREKT-FORM device.

Write today for Bulletin of Technique

These are important DIREKT-FORM features:

- √ Eliminates plaster casts
- √ Can be handled at room temperature
- √ Simple technique
- √ Light-weight and durable
- √ Readily reshaped
- √ Allergy-proof, easily sterilized
- √ Radiolucent
- √ Cosmetically more appealing to patient

DIREKT-FORM

155 Hackensack Avenue, Hackensack, N. J.
EXCLUSIVE NATIONAL FRANCHISES AVAILABLE — for many countries. Write for proposal.

A thoroughly modern private Spa under conservative medical supervision

THE *Homestead*
HOT SPRINGS, VIRGINIA
M. B. Jarman, M.D., Medical Director

OPPORTUNITIES AVAILABLE

WANTED: Ass't or Assoc. prof., physical med. & rehab; new rehab. center. For further information, please write Burneice Larson, Director, Medical Bureau, Palmolive Building, Chicago.

WANTED: OCCUPATIONAL THERAPISTS: (a) Three; one should be int. psy. patients, another, ped., 3rd, gen. patients; one of leading priv. practice groups; univ. affils. (b) Chief & three therapists; new 300-bed hosp., univ. med. center, NW. **PHYSICAL THERAPISTS:** (c) Chief; 200-bed gen. hosp; coll. town, Calif. (d) To serve as adm. of new rehab. center for children; 38-bed unit, univ. med. center; rank: ass't adm. in charge of rehab. center; unusual oppor. (e) Chief & staff; 300-bed hosp; coll. & resort town, Rocky Mt. state. (f) Staff; 250-bed hosp., residential town, 40 miles from NYC. (g) Group ass'n; health resort town near med. center, So. (h) Fine hosp; Hawaii. (i) Chief; new orth. hosp; resort town, SW. (j) County health dept; work principally with cerebral palsy child; San Francisco area. (j) Chief; 200-bed gen. hosp., well equipped dept. averaging 30 patients daily; univ. town, MW; min. $5000. (k) Qual. serve as chief; fairly large hosp; So. Calif. (l) To take charge dept., new hosp; resort & coastal town, Fla. (m) Take charge of phy. therapy, county hlth dept., met. area of E. (n) Take charge dept., new dept., small gen. hosp; Mich.

For further innformatnion, regarding these opportunities, please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

We earnestly invite applications for the position of Physical Therapist in a small, new and growing clinical center for the cerebral palsied located in Bridgeport, Conn. (population 160,000) one hour's ride from New York City. Minimum salary, $3600 plus benefits, opportunity for research and advanced study. Write Edmund S. McLaughlin, Executive Director, Fairfield County Cerebral Palsy Center, 360 Norman St., Bridgeport 3, Conn.

Therapeutic Furniture and Equipment

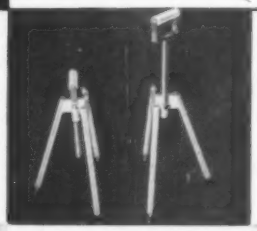
DESIGNED BY BAILEY

EXCLUSIVELY FOR JAY L. WARREN, INC.

Attractively and Therapeutically Designed With The Assistance of Many of the Nation's Foremost Doctors and Therapists

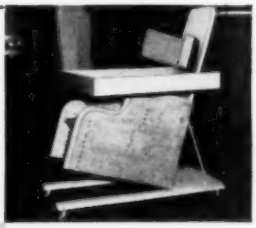
Bailey's Therapeutic Furniture establishes the correct posture—for "as the twig is bent, so the tree will grow"

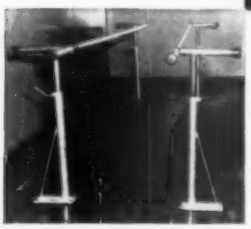
For Occupational and Physical Therapy, Speech Departments, Kindergarten Playrooms, Adult Rehabilitation and Home Care



The Bailey Tripod — Crab Crutch is a new and versatile ambulatory aid. Spade type hand grip is exactly centered above three legs for maximum stability. Made of light weight tubular steel. →

Bailey Relaxation Chairs are the complete answer to every seating problem of the Occupational, Speech and Physical Therapist. Full range adjustment of seat, foot board, back and tray positions. →

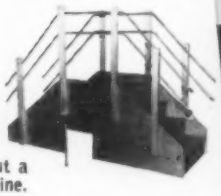




← Bailey Parallel Bars contain every feature considered essential by leading authorities in the Physical Therapy field. Floor mounted types, semi-portable types and models for children.

Bailey Treatment Tables are extremely well constructed; are available in several models and can be had with or without storage shelves, drawers and adjustable back rests. ←

Bailey Safety Training Stairs provide a graduated training program from easy 4" steps to 10" steps. Absolute rigidity instills confidence. Exclusive safety features accelerate training progress. →



The above photos represent but a small part of the complete line.

Write For Your Copy of the NEW Attractively Illustrated Catalog

Jay L. Warren, inc.

Tel.: EAstgate 7-5388

1247-49 W. BELMONT AVE. • CHICAGO 13, ILL.

Announcing . . .

The Annual Prize Lecture

sponsored by the

AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION

To stimulate interest in the field of physical medicine and rehabilitation, the American Congress of Physical Medicine and Rehabilitation will award annually, a prize for an essay on any subject relating to physical medicine and rehabilitation. The contest, while open to anyone, is primarily directed to medical students, interns, residents, graduate students in the pre-clinical sciences and graduate students in physical medicine and rehabilitation. The Prize Lecture Committee suggests that members of the American Congress and American Academy of Physical Medicine and Rehabilitation bring this announcement to the attention of interested persons. The following rules and regulations apply to the contest:

1. Any subject of interest or pertaining to the field of physical medicine and rehabilitation may be submitted.

2. Manuscripts **must be** in the office of the American Congress of Physical Medicine and Rehabilitation, 30 N. Michigan Ave., Chicago 2, not later than June 1, 1956.

3. Contributions will be accepted from medical students, interns, residents, graduate students in the pre-clinical sciences, and graduate students in physical medicine and rehabilitation.

4. The essay must not have been published previously.

5. The American Congress of Physical Medicine and Rehabilitation shall have the exclusive right to publish the winning essay in its official journal, the ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION.

6. Manuscripts must not exceed 3000 words (exclusive of headings, references, legends for cuts, tables, etc.), and the number of words should be stated on the title page. An original and one carbon copy of the manuscript must be submitted.

7. The winner shall receive a cash award of $200, a gold medal properly engraved, a certificate of award and an invitation to present the contribution at the 34th Annual Session of the American Congress of Physical Medicine and Rehabilitation at The Ambassador, Atlantic City, N. J., September 9-14, 1956.

8. The winners shall be determined by the Prize Lecture Committee composed of four members of the American Congress of Physical Medicine and Rehabilitation.

9. All manuscripts will be returned as soon as possible after the name of the winner is announced.

10. The American Congress of Physical Medicine and Rehabilitation reserves the right to make no award if, in the judgment of the Prize Lecture Committee, no contribution is acceptable. The Congress may also award certificates of merit to contributors whose essays may be considered second and third best submitted. Announcement of the winner will be made after the annual meeting.

$1000.00 Cash Award

AS PROMISED ONE YEAR AGO BY THE BIRTCHER MEDICAL FOUNDATION, ON THE SUBJECT OF ULTRASONICS IN MEDICINE, WILL BE ANNOUNCED NEXT MONTH

The independent Medical judges are now making a careful study of the many papers submitted for consideration. As of the closing date of this issue, they have not made their final selection so...

SEE NEXT MONTH'S ISSUE OF THIS PUBLICATION FOR THE WINNER

THOUSANDS OF ULTRASONIC MACHINES WENT INTO USE IN 1955

1955 was a tremendous year in the sale of ultrasonic machines to the Medical profession. With new technics and clinical success being reported almost daily, we fully expect 1956 to surpass 1955 in the use of ultrasonic energy in medicine.

If you are not "up" on Ultrasonics, we will be happy to send you a large collection of reprints on the subject, covering the treatment of many diseases and conditions.

THE BIRTCHER CORPORATION

world's largest volume producer of electro-medical-surgical equipment... makers of the versatile hyfrecator

THE BIRTCHER CORPORATION
Department APM 2-56
4371 Valley Blvd., Los Angeles 32, California

Please send me the collection of ultrasonic reprints

Dr. _____

Address _____

City _____ Zone ____ State ____